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AMERICAN MACHINIST

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American and Other Machinery Abroad.—VIII.

[Editorial Correspondence.]

MACHINERY AT THE BRUSSELS EXPOSITION.

I came to Brussels expecting, among other things of interest, to see and be able to give some account of the machinery shown at the Exposition, which has been open here for some time past. I may be able to do this later; but at present, though the date of opening is long past, many of the exhibits are, as yet, in so incomplete a state that little can be seen or learned of them—a good deal of the machinery that is in place being covered up, and some of it actually yet in process of construction in Brussels workshops, where parts of machine tools to be exhibited were shown to me last Saturday. We thought Chicago was rather bad in this respect of not being ready for opening, but Brussels, it is needless to say, is much worse. It is going to be a fine exhibition, however, and will, it is hoped, be quite successful when finished and the Queen's Jubilee is over, so that Englishmen, who will at present think of or discuss little else but jubilee, can come to see it.

Though Brussels is a little behind time with its exhibition, it is by no means so behind the times in other respects, but, on the contrary, gives evidence on every hand of being quite progressive. On the 1st inst. a line of street cars propelled by electricity, which is carried on an underground wire, began running to the Exhibition grounds. If you get onto any car of this line, the conductor will sell you a ticket for the exhibition, and for five centimes (one cent) additional fare you remain on the car and are taken through the grounds, so that you can alight at any desired point. Within the grounds there is an overhead wire, instead of an underground one; this portion being only a temporary track where low cost of construction had to be considered. The underground conductor outside and the overhead one inside the grounds are in the same circuit.

MACHINE TOOLS EXHIBITED.

Among the tools shown in the Exposition, those of American manufacturers decidedly predominate, and there is, in fact, a very creditable display of our smaller sized machine tools exhibited by Fenwick Freres, of Paris, and Schuchardt & Schutte, of Berlin. These exhibits are complete, too, and ready for inspection, while those of the Belgian builders are, as yet, very incomplete. In one of the spaces assigned to a Belgian tool-builder, I noticed a work bench, and several machinists were employed in those operations which are preferably done in workshops usually, and I noticed one that we do not perform at all, either in exhibition spaces or elsewhere. This was filing out the worm teeth that had been cut on the edge of the swivel plate of a boring mill head to make the worm work properly; a small bent file being the doctoring instrument employed.

A Belgian engineer remarked to me that it seemed rather queer to him that a country so well advanced in engineering matters generally should be so backward in respect of tool construction. He said, so far as he knew, there is scarcely a creditable machine tool produced in Belgium that originated here. Sometimes they copy a good tool, but as often a bad one; or spoil a good one by changes imagined to be improvements. It would hardly do for me to say so much, but certainly the Belgian exhibit of tools is, in the main, a copy of our own and of English practice, and is of that indescribable character which is always noticeable in copied machinery. In a side planer I noticed that the widest bearing for the saddle on the arm was where it never can by any possibility be of any use, and the narrowest where the widest should be. Lathes having our form of shears have them ridiculously small in some cases, and with beds very narrow in proportion to the swing of the lathes. They also have the lead screws apparently as low as they can get them, instead of as near the tool as possible; the narrow beds and low lead-screws being, perhaps, English ideas grafted onto our lathes, where they manifestly do not belong.

A universal grinder shown is, in its main features, an attempt to copy, in the one machine, both of our American universal grinders, and, in my opinion, leaves out the best features of both of them; whereas if either had been copied entire, the best features of that one at least would inevitably have been reproduced, instead of being skillfully avoided. I regard it as a fortunate thing for Americans that our machine tools are thus shown alongside of Belgian ones; but it is a pity that some of our heavy tool builders could not have seen their way to exhibit here. I cannot help thinking it would have benefitted them. But for that matter, we would have had no representation worth speaking of in any line, had it not been for our foreign agents, who brought part of their stocks here. The American section is scarcely worth speaking of as an exhibit.

THE BOLLINCKX SHOPS.

Naturally one of the first places to be visited here is the establishment of H. Bollinckx, whose name is familiar to our readers. H. Bollinckx, however, died about four years ago and the business is conducted under the same name by his son Arthur, who is decidedly one of the most wide awake and progressive men I have met in my travels. He employs 250 men, making Corliss engines, almost if not quite exclusively, follows American methods almost purely, and has a profit sharing plan in operation which has been working satisfactorily for several years; there having been, the first year, 6,000 francs (about $1,200) to divide among the workmen and next year there will be 45,000 francs ($9,000). The workmen are Belgian mainly, though some of them got their first training at Krupp's and other well-known shops in other countries. With these men Mr. Bollinckx says he usually has at first much trouble to get them started using American tools as they should be used, but he gives his personal attention to a new tool or to a new man as long as may be necessary and after that there is little trouble. The men he says decidedly prefer the American tools after becoming accustomed to them. The elder Bollinckx did not go in for American ideas and the shop has, I understand, been Americanized by its present owner, who, though he has never been in America, and declares that business and

dread of seasickness keep him away, has yet absorbed so many of the American ideas, and so well combined them with his own, that his shop is an excellent example, and if the workmen could be a little changed in appearance and could speak English, would make an American feel quite at home. All the machine tools are painted white and the shop is as neat and clean as a pin. It is one story high only, and is lighted from the roof, though it is not in all respects of the most modern construction, because most of it has been built a long while, the establishment dating back some 30 odd years.

LATHE CENTERS.

In minor matters, such as the angle of lathe centers for instance, I noticed that our practice is followed in this shop, and when I spoke of this Mr. Bollinckx said the continental angle for centers was much greater, i. e., more blunt than the English, which last is more blunt than the American. Some years ago he had changed the angle in his shop from 90 degrees to the American 60 degrees as a result of experience and trial and declares his conviction that lathe work comes truer with 60 degrees centers, than with any blunter angle. Blunt centers are somehow inseparably associated in my mind with a lack of acute sensibility respecting the niceties and refinements of machine shop manipulations. There may be, somewhere, a machine shop using blunt, or what might be called wide-angle centers, that has nice neat and refined workmen in it, and thus habitually does nice, neat and refined work; but such shops are certainly rare in America if they exist at all, and the apparently simple circumstances that this Belgian shop has come to recognize the essential brutality of a blunt center, and has adopted an angle that is much more acute and that is standard, is to me significant. It means much more as an indication of the degree of mechanical enlightenment attained than does the mere purchase of a fine machine tool, more or less, which may be used appreciatively and properly, or may be abused. It is my belief that a shop that has gone far enough to have 60 degree centers, and to see that they are all kept to the standard and in good order can hardly fail to do good work, because refined and approved practice in this respect can only be the result of an appreciation of refinement in workshop manipulations. This, however, is not by any means the only evidence of good work to be seen in this shop.

NO KEYS.

It is customary here to make engine cranks of forged steel. In the Bollinckx shop they simply shrink these on—heating the crank to a deep blue. Small pins about the valve motion are pressed into place, and in none of these, nor in the fly-wheel are any keys used. They do not come loose, and I wonder if there is anything in our American climate that would make them come loose if we also discarded a lot of our keys. It might be worth trying at any rate.

SCREW MAKING—AMERICAN AND ENGLISH.

In a former letter I spoke of the preferred English practice of putting a turret on a cross-slide and using the tools thus held precisely as in a lathe for making screws, which we would prefer to make with a central turret and tools of a different character. I found English and Scotch opinion generally quite divided as to the superiority of their practice in this respect, and I am more than half inclined to think they are right for the present. It fits their general shop practice better, I think, than our way would. I am, however, quite certain that it would not fit our shop practice, and that we should be taking a long step backward to adopt it. An opinion on this point which ought on some accounts to be worth more than either of those mentioned, is that of Mr. Bollinckx, who, after operating for years English machines for making screws, put in, about a month ago, a "flat turret" lathe, and as a result of his experience with it will put in another one at once, and the English machines are to be gotten rid of as soon as possible.

THE PRODUCT OF LABOR.

The production of this machine is not, however, equal to what is done with it in America. When I learned this was the fact, I naturally looked for variations in practice which would account for it, and upon asking one question after another found they were using stock (steel) made in America; self-hardening tool steel for the tools, made in America; and good lard oil, made in America. Finally by a process of elimination I found that the only things about the machine not made in America were the man who operated it, and the belt. I think a change of belts would have little influence, and am forced to conclude that the difference is in the man. But, then, he has had only a month's experience.

I was informed in Ghent by one of the younger Carels, of Carels Bros.' engine-building establishment, that their 400 men were about equal to 200 men in an American engine shop; this statement being based upon my informant's experience here and observation in America, where he has spent considerable time. The men work by the piece at Carels', but are inclined to lack ambition and to be apparently unable to put that spirit and vim into their work which is common in our own shops.

AN ENLIGHTENED METHOD.

I do not mean to indulge in mere boasting, either for myself or for the "American Machinist," but only to give that degree of credit which by right belongs to American mechanics generally, when I repeat Mr. Bollinckx's statement to the effect that his shop practice, as it is carried on to-day, is due mainly to his study of American ideas about machinery and shop methods as set forth in our columns. His method is to go through the paper and, as he reads it, mark in places the initials or names of those foremen and others in the works whose attention he wishes to call to the article or paragraph thus marked. These men do not read English, but they look through the paper, get what they can from the engravings, and then get from Mr. B. a translation of the parts marked for them, and can ask him for any explanation they may desire.

I have not found very many shops at home in which more pains are taken to arouse and cultivate an intelligent interest among the men.

In fact, my mind goes back to the Chicago Exhibition, where, in the space of one of our best-known New England tool-builders, I found a young machinist, just "out of his time," who was not even fairly intelligent regarding the machines he was supposed to be helping to exhibit; who, when I presented my card, said he used to see the "American Machinist," but many of the articles were too hard for him to understand. In conversing with him, I found he knew what a shaft was, but when I spoke of an oscillating shaft he was bewildered. The same firm has an exhibit here in Brussels, and a young man whom I found in charge of it, also from the shops, was evidently unacquainted with devices which ought to be and are familiar to intelligent machinists the world over—simply because they did not happen to be made in the particular shop in which he worked. It is needless to say that Mr. Bollinckx does better than this particular American shop in respect of making use of the means of advancement and diffusion of intelligence regarding his business.

From the example set by this shop, many other American tools have been sold in Belgium, for Mr. B. freely exhibits them, and as freely states their advantages.

Like Professor Sweet, Mr. Bollinckx has the word "Welcome" over his shop door, evidently having full belief in the fact that a man who is really competent to compete with him can do so very well without seeing his shop at all, and that one who is not fitted to become a serious competitor cannot qualify himself by walking through the shop.

WAGES.

The minimum wages paid in this shop are about 27 centimes, or say 5½ cents per hour; the maximum, 54 centimes, or not quite 11 cents per hour, exclusive of the dividends above referred to; and wages are 17 per cent. of the selling price of the work. Mr. Bollinckx freely says

that his business is profitable, and in considering the wages paid, which are somewhat higher than usual here, it is to be remembered that things generally are measured by a different standard of value. In fact, an American belonging in Minneapolis, who is staying here for some months, declares that a franc goes as far here as a dollar in America, which may be something of an exaggeration, but if only half true would make the wages question look quite different from what a mere statement of figures does.

At any rate is evidently a city in which people enjoy life very much, and apparently live for the purpose of enjoying it. In fact, Mr. Bollinck says there is really too much pleasure for the good of his workmen—too many attractions for their money and too many holidays.

TOOL BUILDING.

Some of the tools in the Bollinckx shops were designed by Mr. B. himself for his own work; one of them we have published an engraving of, and shall give some account of others. Some of his lathes are virtually American, but were built here in Brussels by J. & M. Demoor, who employ about 100 men building tools, and whose shop I visited and was shown about by the engineer and works manager, Paul Lamal.

I found them building some tools distinctly English in appearance, and others as distinctly American. The latter are designated in their catalog as "Tours Americains," etc., thus "giving the devil his due," and besides they have some ideas of their own in tool construction which I may be able to give some account of later. Besides making they also buy and sell tools of other makes, and have a show room connected with their works and another in the business section of the city. In the room at the works there were a good many tools of American manufacture.

The other tool-building establishment here is called the "Progrés Industriel." It employs about 200 men, and builds quite a variety of machinery other than tools. The tools here also may be described as of mixed English and American design, with an occasional example of pure one or the other, but they have gone extensively (for them) into the manufacture of the Pitler lathe (which we published an account of a few years ago), and they show it in many different forms and styles.

While there is no law to that effect, yet it is the practice of the government to favor Belgian builders of tools and other machinery, and as the Belgian government owns and operates most of the railways and is acquiring the others, this is of considerable importance to tool builders, and practically excludes our tools from the railway shops unless they are special in character or not made in Beligum. Perhaps this has something to do with the fact that I saw here in Brussels a Gray planer with the name and address of the builder, which had been cast on the face of the tie-beam, chipped off and painted over.

AMERICAN TOOLS AT COCKERILL'S.

I found a good many genuine American tools in use in the famous Cockerill establishment at Seraing, near Liege. They speak well of them and are at present putting in some American planers. They say they are not high in price compared with others, are of excellent quality and can be had on demand from stock.

Among others I noticed there an American boring and turning mill put in some time after the Chicago exhibition. I was informed that this, though considered by them an excellent tool, and one which ought to be entirely satisfactory in view of its large use in America, for some reason did not do well here, the workmen appearing not to understand its use. As nearly as I could judge the trouble in this case arises from an attempt to do on this mill work which, owing to its character, would be done in the lathe at home, while they must in such a large establishment have plenty of work which the mill can do much better than any lathe.

CLEANLINESS AND NEATNESS.

I shall have more to say of this establishment in future, for it is remarkable in many ways, but in none more so than for its scrupulous cleanliness and neatness throughout, this being indeed a characteristic of Belgian engineering establishments generally.

The Bell Telephone works at Antwerp is a model in this respect. Its superintendent, J. B. Edwards a former shopmate of mine in America, has organized and is carrying it on entirely with native help. Telephone building here is not a monopoly, but they must be built in open competition with the factories of the world, often to various government specifications, and this competition is carried on there successfully with complete American equipment, including even the engines for driving. The factory presents a very strong contrast to most of those I visited in Great Britain, especially in the appearance of the girls and women employed. It is impossible for one with any spark of human sympathy in his breast to go through some of the English factories where girls and women are employed without being made heart-sick, and the contrast between them and the Bell Telephone works in this respect is a very striking one. The girls are not hopeless, dull and repulsive, but bright, spritely, deft and neat—looking in fact as though life meant something to them more than drudgery, coarse food and dirt.

BELGIUM AS AN INDUSTRIAL FACTOR.

Belgium is sometimes called the workshop of Europe. A great deal of manufacturing and engineering work is done here, and done very well indeed. The Belgians are industrious and enterprising; they have abundant capital; they work cheaply, and they have little or no hesitation in taking up with a new idea. Their attainments industrially have been much less than those of the British people, which is perhaps unfortunate for them; but it has its compensations, if it is in any degree to be credited with the fact that Belgians are, in mechanical and engineering matters, not excessively conservative and cautious. They do not hesitate to spend money readily for a machine or device that seems likely to give them an advantage.

A man in England who had an improved can or reservoir for holding a barrel of lubricating oil and for filling oil cans from it without waste or muss, came over to Antwerp not long ago, and sold to a friend of mine, who is superintendent of a large factory there, two of these cans to begin with, and with this as a start, he went about the place and sold over a hundred of them in a few days. He sold them by a small sample, and my friend said that though the Englishman had been trying to do business in that line for a long time at home, he had probably never before dreamed of having so many orders at one time. He was so elated that he could hardly keep his feet on the ground, and went home to tax the productive capacity of his shop to fill the orders. He had simply, for the first time in his life, encountered people who not only do not repel new ideas and new things, but reach out for them.

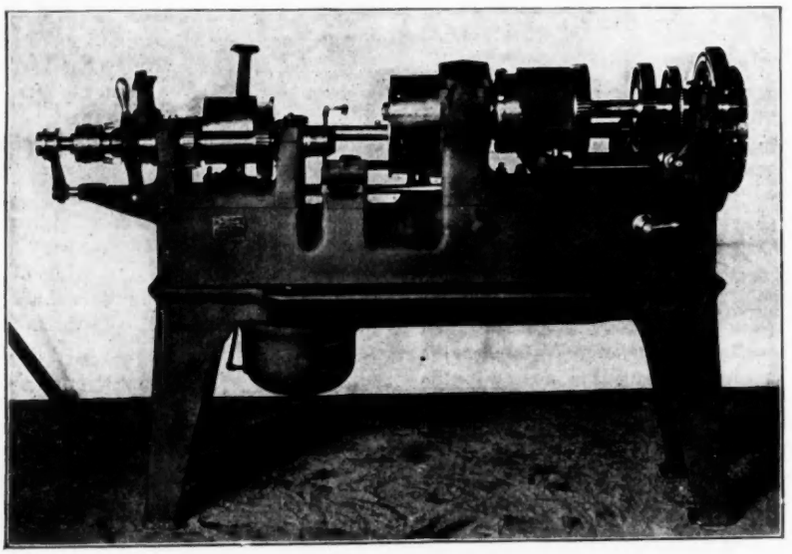
English manufacturers are feeling keenly Belgian competition, and its severity is generally ascribed to low wages and long hours of labor. Wages are low, and workmen generally labor twelve hours per day. But this is not, it seems to me, the only or the chief reason for their effective competition with the older manufacturing industries of Britain.

There is a class of manufacture here that does depend entirely upon cheap men and long hours. In this cheap imitations of good bicycles are made, and they make, for instance, an imitation of a Smith & Wesson revolver which sells at retail for 15 francs or $3. One of them purchased in a store for the purpose of deliberate inspection, proved to have its barrel 2 degrees out of alignment with the cylinder and some of the chambers off-set 1-32 inch with the barrel; the cylinder ratchet having been filed by hand. The barrel was beautifully rifled, however, and all parts likely to be seen and appreciated by the ordinary buyer looked well. Such things are made by what may be called misguided skill and industry. I have evidence that the same skill and industry, properly directed, produces fine work, and it is found that as progress is made in other respects, wages tend to advance.

F. J. M.

Origin of the Pelton Wheel.

In our issue of August 13, 1896, Professor Sweet stated that he had been informed that Professor F. G. Hesse, of the University of California, had made the original drawings of the bucket of the Pelton wheel. Since then a pamplet has been issued, February, 1897, by Joseph Moore, in which he makes claim to the invention. We are now in receipt of a more recent pamphlet, published by Mr. L. A. Pelton, containing a statement by Professor Hesse and Mr. Pelton's own narrative.



THE CLEVELAND SCREW MACHINE.

From the statement of Professor Hesse, it appears that between 1865 and 1868 Joseph Moore, then superintendent of the Vulcan Iron Works, San Francisco, asked the advice of Professor Hesse as to the best water motor under certain conditions stated. Professor Hesse gives a sketch of his course of thought upon the matter. He speaks of the use of the Jonval turbines in pairs, so that the forces of the angular jets impinging upon each would balance each other. He thought of bringing the two wheels together and then of the divided bucket, which is the essential feature of the Pelton wheel. Drawings of the bucket were furnished to Mr. Moore, and Professor Hesse knew nothing of its practical use at that time.

Mr. Pelton's statement then follows. He crossed the plains from Ohio in 1850, and engaged in mining until 1864, when he took up millwrighting in connection with it, and was thus employed up to 1878. He built a number of hurdy-gurdy wheels, which have an efficiency of 40 per cent., and saw a chance for improvement. He provided apparatus for testing, and for two years tried to devise a bucket that would give the greatest efficiency, his well-known bucket being the culmination of a series of thirty or forty different shapes tried. The wheel with this bucket was patented in October, 1880, and it was "invented independently, and without any knowledge whatever, or aid from the efforts of others in that line." Mr. Pelton says, finally: "Without any knowledge of what may have been done in this line by others, I discovered the principle of splitting the stream in a bucket for jet water wheels, and applied it. No tests other than mine had ever been made to determine whether this form of bucket had any practical value, or was only a theoretical possibility. I first demonstrated its superior efficiency, and first brought it into use, and I am fully entitled to the credit that has been given me for the discovery."

▲ ▲ ▲

One of the cheapest, commonest and most despicable details of modern machinery is the collar and set-screw. What would happen if it was prohibited by law, as it should be—at least the one on the running shaft with the projecting square head?

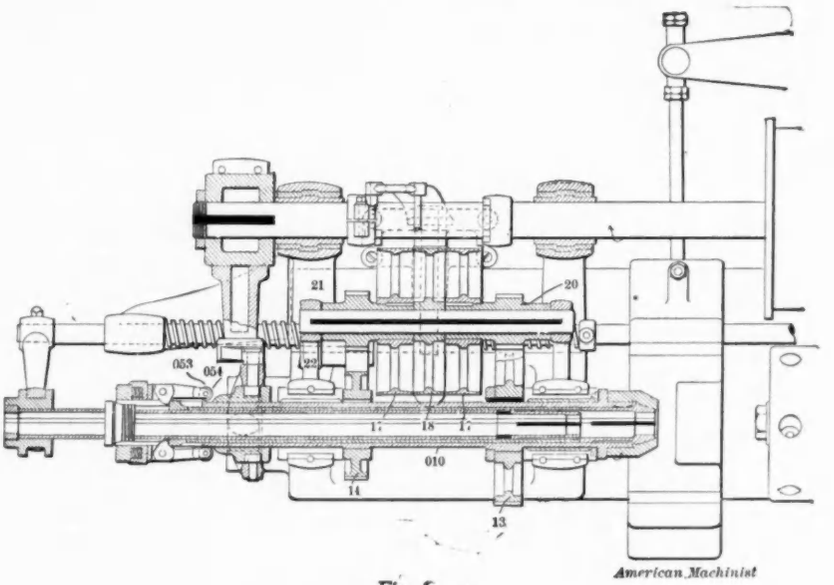


Fig. 1

Marks on Bar Steel.

"Sparks from the Crescent Anvil" reproduces in full the letter of Mr. Morris Fulton with the above title in our issue of April 22d, and adds as follows:

"To foster and secure a more intelligent co-operation between maker and consumer of steel is 'Sparks' ' particular mission.

"The carbon or temper card to which reference has been made, as well as the numerous publications of the Crescent Steel Company on the management of steel, are evidence of this intent.

"We therefore cordially welcome Mr. Fulton's suggestions along this line.

"In the commoner grades of steel, the properties and behavior are influenced, not alone by carbon, but by phosphorus, the "brittle-maker"; by manganese, at some percentages a hardener, having beneficial effects in processes of manufacture, but credited with a tendency to water crack and to increase brittleness; by silicon, when slightly in excess potent in the hardening process and more dangerous than manganese, and by others, probably, of the fifteen or twenty constituents of iron and steel.

"Carbon is undoubtedly the true hardener, and where the pure steel irons of Sweden are used in fine steel making, as by the Crescent Steel Company, the percentage of the other constituents which would affect temper is so low, and the iron is so uniform, that "carbon" and "temper" may fairly be considered as synonymous in their special meaning.

"The heavy duty now exacted from steel tools would seem to emphasize the need of more earnest study on the part of steel users of the physical characteristics and capabilities of steel; if they wish also to go into its chemistry, they will find a wide and interesting field for research."

The Cleveland Automatic Screw Machine.

This interesting machine, built by the Cleveland Machine Screw Company, Cleveland, O., is shown as fully as our space will permit in the accompanying half-tone and engravings. The essential features of the machine may be gathered from a brief description. Fig. 1 is a horizontal section of the spindle head or left-hand portion of the machine as seen in the half tone. The pulleys 17, 17, with the loose pulley 18 between them, are keyed on the hubs of pinions 20 and 21, the former engaging directly with spindle gear 13 and the latter driving spindle gear 14 through the intervention of the intermediate pinion 22. One driving belt thus drives the spindle in either direction. The chuck levers .053 have rollers .054 for operating the chuck easily.

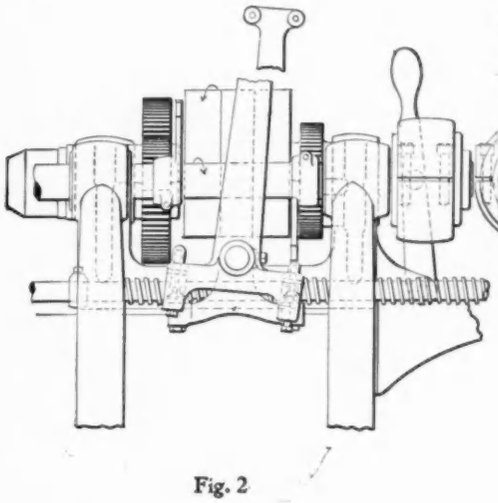


Fig. 2

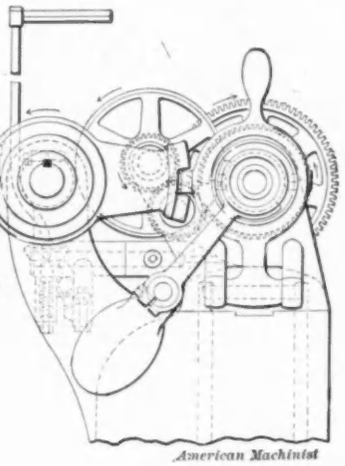


Fig. 3

Fig 2 is a rear elevation of the spindle head, and Fig. 3 is a left end elevation, showing the belt shifter and the means for quickly shifting the belt. The belt shifter 35 is held in position, either way, by the latch lever .036 engaging with the shoulder of the screw .034. The cam 37 shown in dotted lines compresses the spring under the plunger .035, and its continued movement releases the latch lever .036, after which the spring almost instantly shifts the belt and reverses the spindle.

In Fig. 5 (which is a horizontal section of the tool feed, tool turret and cross slide) the feed driving pulley 75 is keyed on the hub or sleeve of the disk 80. The friction wheel 82 communicates motion from disk 80 to disk 81. Shaft .090 carries a pinion which engages with gear 76. The differential gears .0103, .0104 give a reduced motion to the clutch gear .0102, which is mounted loose on the shaft .099, and means are provided for shifting it automatically to engage alternately with the clutch on pulley 75 for the idle movement of the machine, which permits a quick change of position of the tools, and with the clutch gear .0106 for the working movements of the machine requiring a slow feed.

In order that each tool may take the proper feed for its work, means are provided for automatically regulating the working feed to any speed required for each tool independently, as shown in Fig. 6. The friction wheel 82 is mounted on a rack sleeve 83, fitted to slide vertically on the post .083. The teeth of rack sleeve 83 engage with a segment gear on an arm of the bell crank lever 84. The other arm of the lever 84 carries a roller engaging with adjustable segments on the wheel 99. It will readily be seen that the speed of the disk 81 is regulated by the position of the friction wheel 82 in relation to the centers of the disks 80 and 81, the speed of 80 being constant. When the friction wheel engages disk 80 near its periphery, disk 81 is driven at its highest speed and gives a correspondingly fast feed to the tool which may then be in operation, and when the friction wheel engages 80 near its center a slow speed for disk 81 and correspondingly slow feed for the tool is obtained.

By adjusting the segments on wheel 99, the friction wheel may be brought to and retained in any desired position for each tool in the series, and the feed of each tool in series may be regulated without interfering with the movement of any other.

A half turn of the handle 92, Fig. 9, from right to left, disengages the feed, and a crank handle is provided to operate the feed mechanism by hand for convenience in setting or adjusting the tools. The machine illustrated is the 1¼ x 5½-inch machine of the makers.

▲ ▲ ▲

Two patents have been recently issued for the use of pneumatic tired pulleys for power transmission. Two pulleys, driver and driven, upon parallel shafts and in contact at their peripheries may both have pneumatic tires or either one of them may be solid. There are evidently places where this arrangement might be quite serviceable.

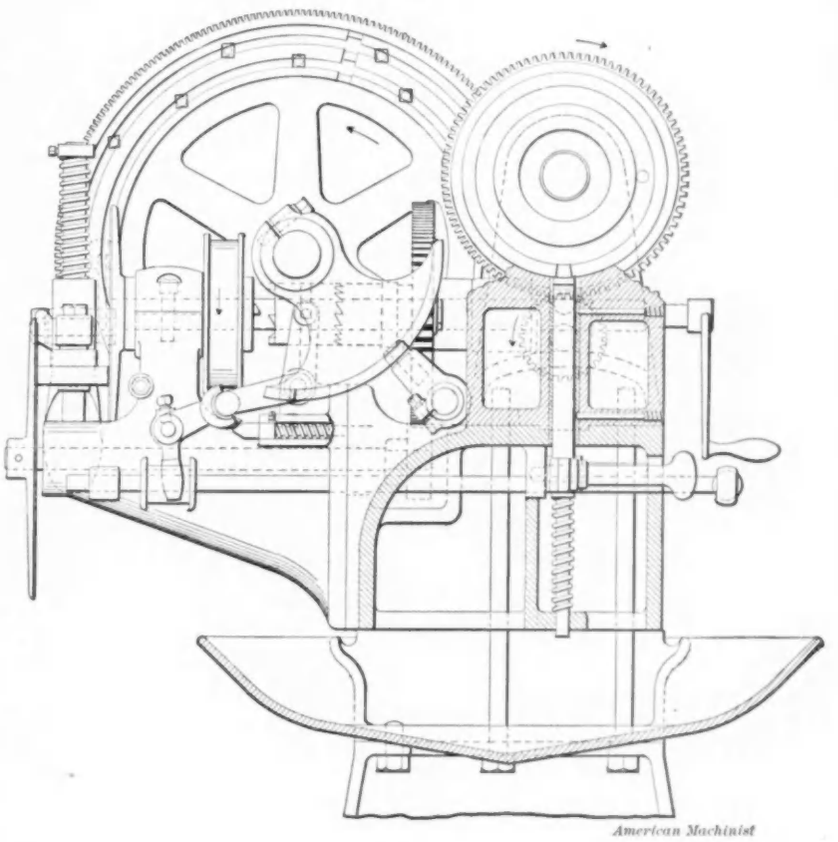


Fig. 4

Steam, Air and Electric Motors.

A committee of the American Railway Master Mechanics' Association sent out a circular containing a series of questions upon the above topic, receiving replies from twenty-four railroads and one firm of locomotive builders—the Baldwin Locomotive Works. The motors reported upon in use were thirty-six steam, seventy-two air and two hundred and twenty-two electric. As might be expected, neither style of motor is recommended exclusively, while each in turn is preferred under special conditions. The conclusion of the report, for which alone we can properly give room, treats mostly of compressed air:

"The following are some of the items compressed air is universally used for in connection with suitable appliances, with an average of from 25 to 50 per cent. economy over the former practice:

"Tapping out stay-bolt holes; screwing in stay bolts; reaming and drilling holes; chipping and calking; removing tires; beading flues; air hoists, vertical and horizontal; and for all purposes including foundry and ice-house elevators; jacks for raising cars, trucks and locomotives; telescope jacks used in connection with drop pit for dropping drivers; press for forming tinware of every description; presses for

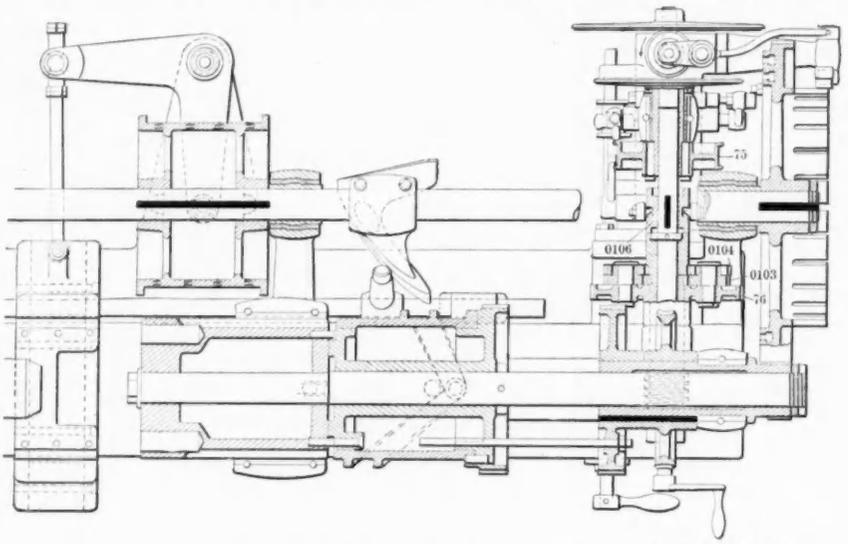


Fig. 5. DETAILS OF SCREW MACHINE.

off test coupons; punching holes that would otherwise necessarily have to be drilled, as the ordinary power punch and shears is not of sufficient gap for the large sheets now going into general use; tank riveters; stay-bolt nippers and pullers; light stationary air hammers in blacksmith shop, made out of Westinghouse brake-pump cylinders, to be used at tool dresser's fire or where general light work is done; shears at scrap pile for cutting up old bolts to standard lengths, and hammer for straightening; shear for light sheet-iron work, made from Westinghouse cylinder at minimum cost; feed for upright nut-tapping machine, allowing operator to handle six taps; also drilling safety holes in stay bolts before being screwed in firebox; machine for centering all bolts before turning. Westinghouse cylinders to operate vises without screw; by the operation of air, apply couplings to and remove clamps from air hose; also the same appliances for operating a knife to cut off old hose from nipples; sandpapering machine; small Pelton wheel for operating small emery wheels; for sharpening tools in convenient places through the shop; blast for blacksmith forges; Westinghouse engines operating large transfer table; applied to mixing paint in large quantities by putting a pipe in the bottom of a barrel; used in all kinds of motors for boring cylinders and facing valves; grinding steam pipes; driving any special machine when line shaft is not running; cleaning out flues; in connection with gasoline for removing tire; cleaning cushions and carpets in and out of cars; blowing out cylinders before applying packing; testing stay bolts; also to move engines to other locations; for different purposes, such as painting, bending pipe, operating letter press, rolling flues, swedging flues, testing brakes, painting cars, sanding roofs, bridges and depots, and several other purposes.

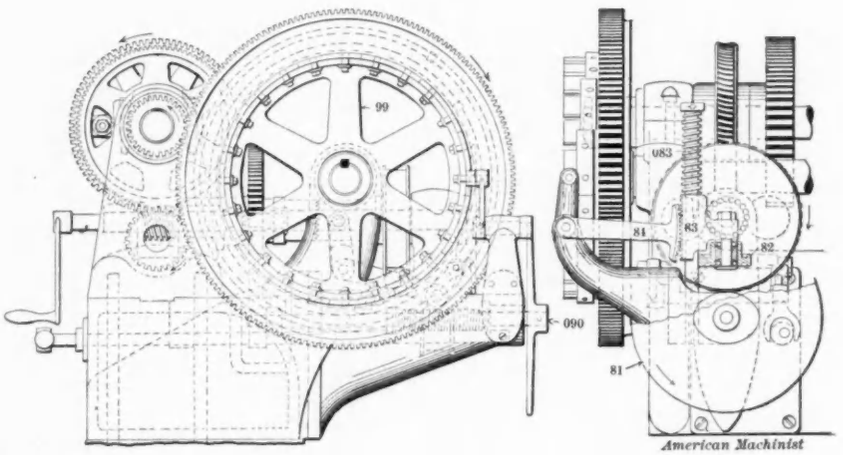


Fig. 7 Fig. 6

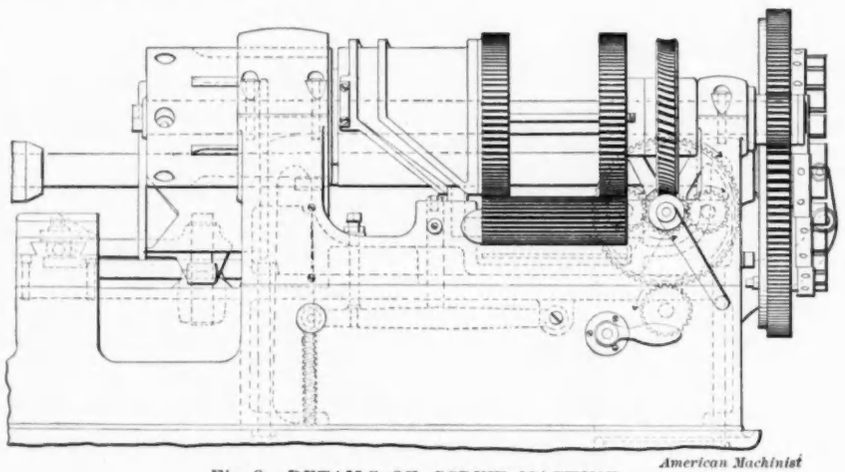


Fig. 8. DETAILS OF SCREW MACHINE.

"Your committee is decidedly under the impression that both air and electricity are an advantage over steam for portable motors, and also that there are conditions

general machine-shop use and pressing in bushings, driving brasses, etc.; large boiler punches; shears, erected and used outside of shop for the purpose of shearing

existing where the electric power is preferable for large permanent motors via line shaft, for driving large tools, and where a convenient operation of an overhead crane is desired. Leaving the latter out of the question, however, where a line shaft can be conveniently operated with a well designed stationary plant, your committee is under the impression the latter is the more economical.

"For small portable tools the air motors are no doubt more convenient, if not as economical. As the committee is unable to gather any definite information based upon practical results that would assist us to establish that fact, but considering the danger of electricity which exists to some extent at least, and then considering the convenience of air in and around the shop, and the fact that any ordinary mechanic can repair, look after and handle air motors, the relative difference would have to be considerable to make the former preferable; however, the power-transmitting capabilities of each in combination with their other individual and peculiar lines of usefulness opens for them a distinct and separate field in which neither can be substituted for the other; therefore, it is well to anticipate the possible requirements for other than the transmission of power before coming to a final conclusion.

"It seems to be certain that power may be transmitted by compressed air for a considerable distance with less loss than by any other known means. This, understand, is not figuring from the moment compression ceases, as there is an inevitable cooling of the air at that time with its necessary loss, but this figure to be taken after it has assumed its normal temperature, when its loss from any considerable distance is practically nothing.

"The capacity of storage reservoirs is also an important item. They should be of such capacity as, under normal conditions of consumption, would enable the air compressor after the first charging, which in a big plant can be done before working hours in the morning, if necessary, to keep up the required pressure by being run at a moderate speed.

"Much is gained by the reheating of compressed air, but it should be done immediately before entering the machine where this work is to be performed to get the full benefit to be gained in expansion. The committee has not been able to obtain any definite information, however, as to what per cent. of economy will be realized, or whether any practical device has been gotten up for portable motors now in use for this purpose, but it believes a simple arrangement can be introduced on stationary motors with very satisfactory results.

"For general railroad work, with the exception of special cases and conditions as enumerated, a well-designed air plant will be the most convenient and economical, all things considered.

"A shop turning out sixty engines per year, with general repairs, has been equipped with an air plant consisting of one compressor, 15-inch steam, 14-inch air and 18-inch stroke cylinders; five ice-house elevators; one hoist for driving wheel lathe; six hoists for lathes and planers; two brotherhood engines; three motors; one pneumatic hammer; one plant for testing air brakes; one sand elevator; one fire-kindler; one flue cleaner.

"The cost of above compressor, including foundations and pipe connections, was $1,260.50. Pipe lines, hose, valves, reservoirs, motors, hoists, elevators and other appliances, $1,189.50. Total, $2,450.

"On a test run of eight hours, it required 313 pounds coal per hour, or 2,508 pounds for the eight hours' run.

"It required five minutes and forty seconds to raise pressure from 0 to 120 pounds. Compressor made 838 revolutions and compressed 2,681.6 feet free air to 193.9 feet at 120 pounds. It requires with this compressor 20.4 pounds coal to compress 1,000 feet free air to 120 pounds, showing 60 per cent. of its theoretical efficiency. As the compressor has been in service eighteen months, an overhauling of the cylinder packing and air valves would probably produce a higher efficiency.

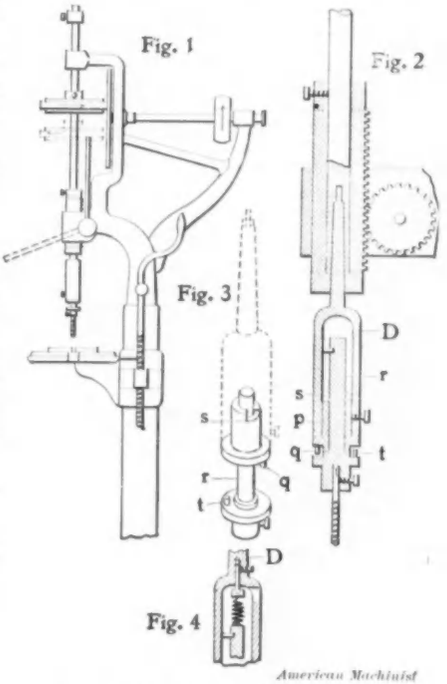
"Compressed air is one of our most useful and most abused agents. It is used in our shops and yards in a very extravagant and wasteful manner. Small leaks are allowed to exist, valves allowed to blow a little, hose couplings leaking, motors from wear consuming an excessive supply of air, each in themselves a small item, but in a large plant collectively amounting to a large waste, causing increased service from the compressor and increased consumption of coal. When we treat our air plant in the same manner as a steam or an electric plant in regard to stopping the small leaks, we will reduce the cost of compressed air and add to its efficiency."

▲ ▲ ▲

A Light Tapping Machine.

The little upright drill illustrated herewith comes right out of the shop, and was designed to meet shop requirements. Mr. Geo. R. Baldwin, manager of the Baldwin Electric Meter Company, Washington, D. C., having need of a small, sensitive tapping machine, and finding nothing to suit exactly, devised the simple attachment here shown for a well-known drill press, and without changing the press in any particular, except putting in a set screw, made a combination tool which very conveniently does all kinds of small drilling and tapping.

The vertical drill spindle is friction driven by the face wheel upon the horizontal shaft. As the spindle is moved up or down by the rack and pinion, it is made to revolve in either direction accordingly as the friction wheel is above or below the center of the plate wheel on the horizontal shaft. When the spindle is fed downward and the friction wheel is in the position shown by the dotted lines, the revolution of the spindle will be right for drilling or for driving a right-hand tap. When the spindle is moved up, bringing the friction wheel as shown at *d*, the spindle will turn backward and the tap will be withdrawn from the hole. The long socket *D* has a taper shank which fits the drill spindle. The bush *n* is fastened in the lower end of this socket, and it has upon its lower face a pin *g* projecting vertically downward, while the upper end of the bush has two vertically faced ratchet teeth *S*. The drill or tap holder *r* has a long straight stem upon which the bush *n* moves freely. When the socket and bush are moved downward the projecting pin *g* strikes the pin *t* on the drill holder, and the tap or drill is made to revolve. When the hole is tapped to the proper depth the spindle is raised, one of the



A LIGHT TAPPING MACHINE.

teeth *S* strikes the pin on the upper end of the drill holder stem, and the tap is backed out. The arrangement has been recently patented, and it is understood that it will soon be placed on the market.

▲ ▲ ▲

You can now buy on the streets a strip of thin elastic rubber about 1½ inches wide and long enough to go around a bicycle tire, with a patent button on the ends for fastening. You slip one or two of these in your pocket when you get away for a spin. When you puncture your tire, all you have to do is just to button one of those menders over the wound, pump her up again, and find out that the contrivance is perfectly worthless.

A Small Bench Milling Machine.

BY A. H. CLEAVES.

The accompanying cuts illustrate a bench milling machine that has been used for many years in different shops to good advantage. The practice of using what are called split or spring chucks in connection with lathes, quills, and milling machines, has prevailed for a good many years in watch factories, and is becoming quite common in other shops of late years. The method is universal in the watch-making and watch-repairing or jeweller's business; and when once used in any place where small model making or light manufacturing is carried on is generally considered indispensable. A number of well equipped manufactories are engaged in making this class of small lathes and chucks, and one or two at least in making chucks alone. Some of the older companies make larger sized lathes with draw-in spindle for expansion chucks. I have spoken of this matter here, as the milling machine described is especially adapted to a line of work in which these chucks are used.

Fig. 1 is a front elevation of the machine; *c* is the spindle that carries the cutter arbors and it has a taper socket for the same. This taper is bored out and finished with a taper reamer, in the soft plug *b*, soldered into the hardened spindle *c*. The spindle *c* is forged tool steel, first roughed out and drilled clear through nearly to size, when it is carefully annealed and finished for hardening. Enough stock is left for grinding after hardening, and the spindle is hardened a short distance beyond the bearing at *f* only. The hardened bushings *f f* are made as seen, the same attention to annealing twice being observed as with the spindle, to prevent change of shape or cracking when hardened. The hardened bearing *k*, is made to slide on the spindle *c* so as to take up end-thrust. A pin or screw with point in a slot in *c* keeps the piece *k* revolving with *c* and the nut *g* pushes it up to its bearing. The nut is sawed open, as shown on the lower side and pinched together to make it bind on that part of *c* which is threaded. The pulley *h* is placed so as to cover the running parts and reduce overhang. In fitting the bushings *f f* to the cast-iron shell *m*, they are held in position on *c* and *k* by a spiral spring placed between them and are then ground on centers.

The plug *b* is solid to start with, and centered, while *c* runs in a back-rest; the other end of *c* at *n* being centered in the same way. Then *f* and *f* are pressed into *m* and the latter is ground or turned off on the same centers. The taper *b* is bored out the last thing.

The casting *o* holds the shell *m* and is sawed open and provided with a screw at *q* to bind *m* at any desired place. The adjusting screw *p* enters a groove turned in *m* and moves the latter for adjusting the cutter; *o* is secured to the up and down slide. The quill or shell *s* is substantially like *m*, except that the spindle *t* is made to receive the regular bench-lathe chucks instead of a taper shank. A frame *u* fastened to *s* carries a pawl *v* which goes into index plates like *w*, as required for different divisions, *w* being attached to the spindle *t*. The holder *x* swivels in a part of the casting for placing the work on an angle, and is fastened with the bolt *z*.

The other views of the machine will explain themselves, excepting some features not shown at all in the front elevation. At *A*, Fig. 2, and *B C D*, Fig. 3, the position of the rack and pinion for up and down slide is shown. The rack *D* is screwed onto the back of *p'*, Fig. 1, and the pinion *B*, Fig. 3, enters a cut in the casting *E* when the handle-shaft *C* enters and is pinned in place. The nut *F* and screw *G*, Fig. 2, give the horizontal movement to the machine head. The boss *H* shows a place for securing any special fixture for holding work as occasion may suggest, such as a sliding vise, rack cutter, etc.

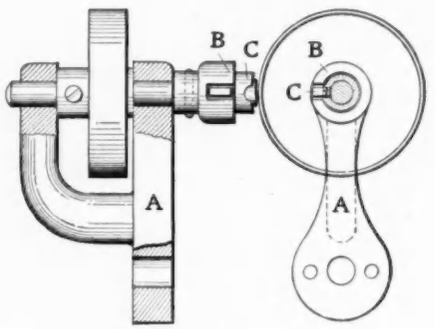


Fig. 8

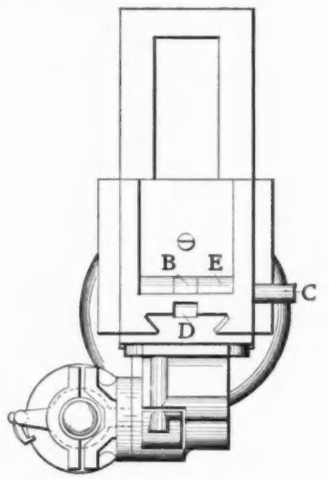


Fig. 3

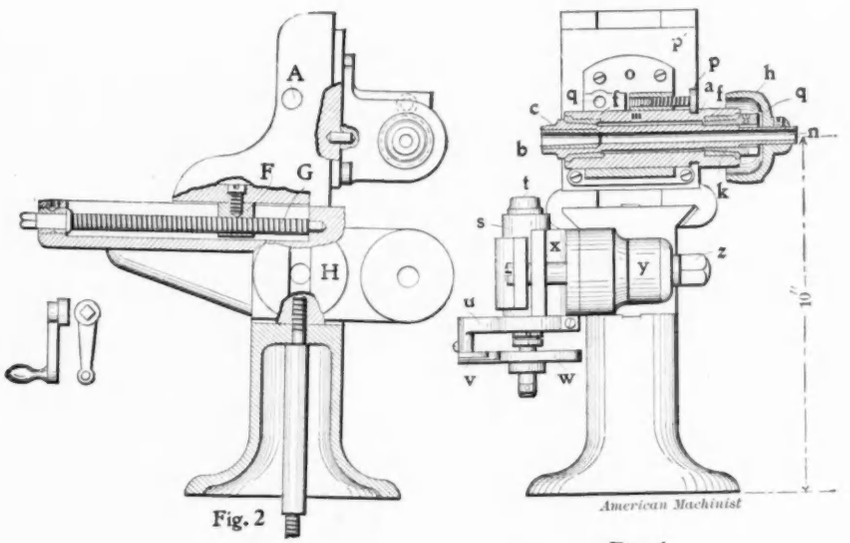


Fig. 2 Fig. 1

SMALL BENCH MILLING MACHINE.

It may appear at first sight that the capacity of such a miller is very limited, but it is not intended for a universal machine, and does not cost as much. It will meet the requirements in quite a variety of work, nevertheless. The attachments shown in the drawings are specially adapted to cutting stacks of saws, straight and bevel wheels and pinions, counterbores, straight and taper reamers, fluting taps, etc., etc.

A yoke with center support goes with the shell *s*, which are shown below.

It will be seen from Fig. 2 that the driving apparatus for the pulley must be arranged with swinging counter, or similar device for following the movement of the machine head forward and backward.

The spring or split chuck and quill and their applications may not be familiar to all machinists, and a fuller explanation of them may be proper.

Fig. 4 is a spring or split chuck, referred to before, and is hardened at the end, where the work is held. This chuck is closed upon the work by being compressed upon the angle *A*. Others are

used on the expansion plan, being forced open with a taper pin from the back or front; and the chuck shape can be used solid, as a holder for face-plates, brass soldering chucks, automatic chucks, saw-arbors, etc., etc., or the general collection of devices common to any lathe.

Fig. 5 is a quill, as it is commonly

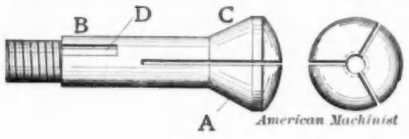


Fig. 4

called, and where the best and most durable results are expected, must be made on the same plan as a bench-lathe spindle, etc. If it is to be run continuously like a lathe, then the shell *A* ought to be made of steel, and be hardened and ground. But if it is to be used for revolving work slowly in a milling machine or gear cutter, while teeth of saws, gear-wheels, etc., are indexed for cutting, the *A* can be made of cast iron. *B* is the drawing-in spindle used for closing split chucks or drawing solid ones into the spindle *C*. The opening at *E* is called the throat, and must be very true; as well the bearing *F*. The part *B*, Fig. 4, enters *E*, Fig. 5, and *C*, Fig 4, enters *F*, Fig. 5. The throat-pin *D*, Fig. 5, is hardened and tempered, and enters all chucks at the slot *D*, Fig. 4, to prevent their turning. *D*, Fig. 5, is driven in tightly by means of an arbor, filling *E*, and having a groove planed on a taper or incline. This fits the straight part of *L*, keeps it in line,

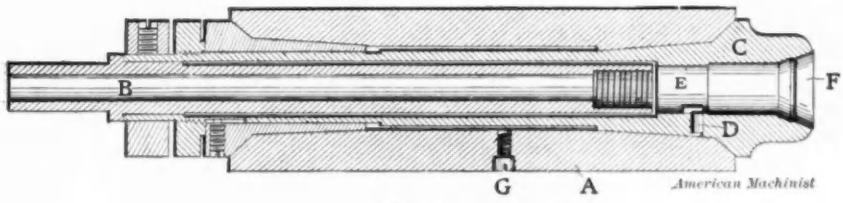


Fig. 5

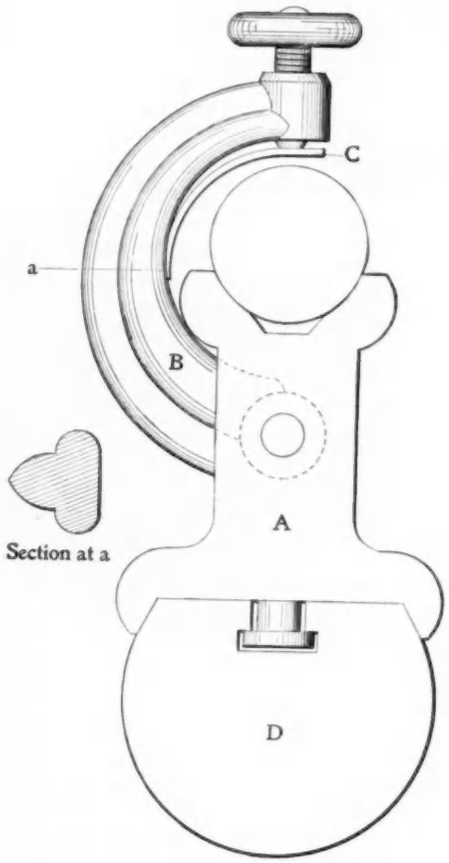


Fig. 6

SMALL BENCH MILLING MACHINE

and pushes it down with the bottom of the groove. The oil chamber of the quill is reached at *G*.

Figs. 6 and 7 are two views of a quill-holder to be used on a bench lathe, or on a milling machine of any make by means of an adapter casting. Fig. 6, an end view, almost explains itself. *A* is attached to a bench-lathe bed in this case. *B* is a swinging clamp with spring protector *C* to prevent the binding screw from marring the quill.

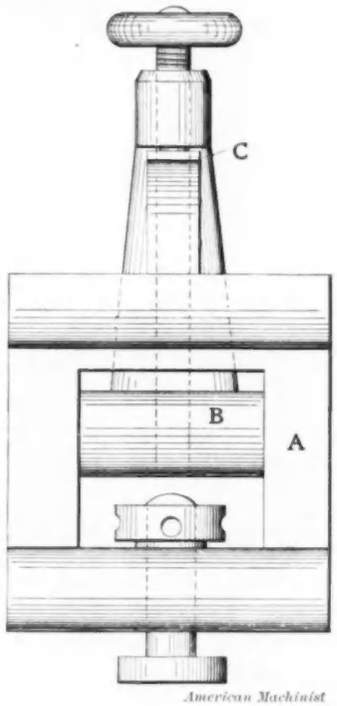


Fig. 7

Fig. 8 shows the method of driving or revolving the quill spindle in usage. The cast-iron frame *A* is secured to the end of a lathe-bed, as at *D*, Fig. 6. It is provided with a pulley and spindle, as shown, being simple and cheap. *B* is a driver pinned to the spindle of *A*, and engages with a dog *C*, which goes on the quill spindle.

Fig. 9 represents one of a variety of center-rests, etc., that clamp on the end of the quill for supporting work on arbors and similar requirements. A description of the many different applications that the quill fixture admits of would go far to recommend its usefulness where it could be employed extensively. Such a description would not comport with the limits of this article. It dispenses with a complete lathe, and admits of special automatic chuck for each important center in a watch-making factory, securing great accuracy with no risk of derangement, and does away with repeated preparation to do the same thing. If any particular jewel sink or pivot hole in one watch-plate is to be made or repaired, the particular quill and accompanying chuck for that purpose is at hand as accessible for one as for a hundred plates. The one in use can be taken out and put back with a turn of the wrist, and no delay nor risk is caused by stopping to do a special job. Many benefits secured by having the quill adapted to lathe, milling-machine or shaper might be described, but can be surmised readily.

Fig. 9

In making the milling machines, if a number are to be made for light manufacturing, some economy may be exercised by planing parts with angles where

possible in a strip to be cut into a number of pieces. Or where this class of work is done to any extent it will be found profitable to have a series of planer chucks made alike; so that one or two pieces held in each box-chuck make it possible to plane up eight or so at once. This plan has been used very effectively in making slide-rests, etc.

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Cast-Iron Milling Cutters.

BY E. A. GAY.

Most machinists know that cast iron can be made hard. Many of us have seen samples that no file or steel tool would touch. Castings have been known to come that way wholly or in spots when intended to be soft, making the luckless operator wish the work and tools could change places, so as to get a little progress in the right direction. So far as I know, however, little use has been made of hard cast iron, considered as a substitute for steel; our knowledge of its cutting qualities being acquired by trying to work on, rather than with it.

I send you samples of milling cutters used by the Enterprise Foundry Company, of Rochester, N. Y., in the manufacture of butts and hinges. These tools are not an experimental freak of some theoretical mechanic, but are genuine milling cutters made by very practical men, and such as have been in constant daily use for years by a substantial and successful concern, turning out good work and lots of it. I also send samples of goods made with these tools.

As will be readily seen, these cutters are plain iron castings, made in the sand from an ordinary gate pattern, without the use of chills or special devices of any kind—just an ordinary, everyday foundry job in extra hard iron. The only special points necessary to observe in making these castings seem to consist of the management of the heat, the fuel used, the iron selected and the amount of brains mixed with the whole operation. These few things attended to, the castings can be made by anyone that knows how. Most of us find it very easy to get hard castings, even sometimes when not wanted.

Of course, the iron run into these castings is not that ordinarily produced, most of the work at this foundry having to be extra soft for butts, hinges and other light castings requiring machine work. A special heat is run as often as required to make up a stock of tools; the balance of the iron left over being run into sash-weights, or other castings not requiring machine treatment.

The samples sent show the method of gating so as to keep the gate away from the cutting edges required; also the even quality of the iron, the cutters being as hard close to the center as at the edges, and the clearance given by making the tool thinner towards the center. One of the cutters is roughly trued up ready for use. Another has been worn out and discarded.

The sample door butt was taken at random from a lot ready to ship, and is a fair example of the quality of work accomplished by these home-made cast-iron tools. It has a good, close-working fit, and would be called a good job anywhere. The stock allowed for milling is barely a sixteenth, to be divided between four cutters. All the work done of this class averages about the same allowance, barely giving enough to get under the scale, making the work about as hard on cutters as it well could be.

The preparation of these cutters for use is a simple matter. Taken as they come from the sand, the gates are carefully ground off the castings, so as to leave no high spots. The cutters are then placed in pairs, the gated sides together, on a high-speed emery-wheel spindle, the collars of which are the same diameter as the collars used on the milling machine where the cutters are to be operated. Carefully centered and tightened up together, the cutters are set running at a high speed, and are trued up with a chunk from an old emery wheel. Of course the cutters are put on so as to run backwards as regards the cutting direction of the teeth, same as a badly-worn circular saw is trued up for filing. The sides are trued up at the same time with the outside diameter, care being taken to produce a sharp corner and to give clearance towards the center. In this way the outside corners of each pair of cutters are brought fairly true, giving one working corner on each cutter that will run about right.

This is all that is needed. The cost of tools made in this way cuts no figure and it is cheaper to throw away dull cutters and put on a fresh pair, than to true up the sides from which the gates have been ground.

The pattern provides for the pairing of cutters so that the teeth will come right when the gated sides are put together for truing up. The sketch illustrates the method of placing the cutters, in every case the gated, unfinished side of the tool being turned away from the work.

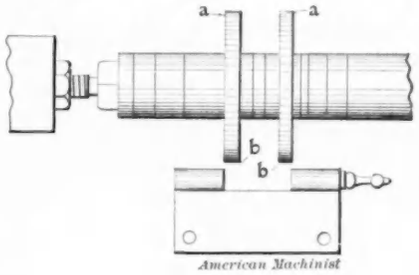
A thin washer the size of the collar is sometimes slipped on between the cutters when trued up when the tool is desired to be especially true.

Of course it seems at first sight unlikely that such a roughly constructed "chopped out with an ax" sort of tool can be made to run true and do good work, but when it is considered that the castings are carefully molded from perfectly true patterns and that the gate is kept well away from the center where the bearing is to be, the case seems a little more hopeful. I am free to confess, however, that I do not expect yet a while to see cutters for making gear teeth produced in this way, though I would not like to say it could not be done if the man who got up this scheme undertook the job.

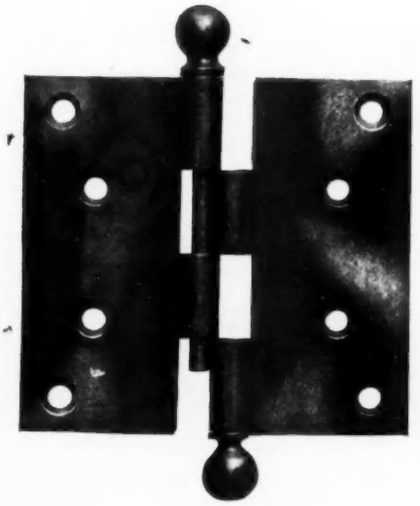
The cost of cutters made in this apparently primitive fashion is small, ranging from a cent to a cent and a quarter each

at the outside, according to the estimate of the superintendent, Mr. Richard Verian, who originated this somewhat unusual method. The wearing qualities of these cutters are not the least surprising thing about them, being twice that of good steel cutters. They are also run at a higher rate of speed than steel tools would be, largely increasing the output. Each cutter averages from 8,000 to 10,000 cuts before dropping into the scrap heap, lasting about two days—fair production, considering cost of the cutter.

When the Enterprise people started in some years ago to make butts, they began with steel milling tools as furnished with the machines. These cutters were the regular Brown & Sharpe make, as



American Machinist



good as could be had, and cost rather more than a cent and a quarter apiece. The first hard day's work about used them up, and Mr. Verian was called on for new sets. It being apparent that new cutters every day or so would cost considerable, he felt moved to try a little experiment on his own account. Taking a new Brown & Sharpe cutter as a pattern, he got out a set of castings from some sash-weight stock they happened to be running at the time, mixing the iron and fuel to suit his own ideas, without regard to the opinions of practical hands of the concern, who knew he was trying something that could not be done.

The castings were made, trued up and set to work. The next day saw a regular pattern-gate made, and from that time to the present all the butts and hinges made by this concern have been milled out with these home-made hard cast-iron tools at these works. The same idea has been applied for other tools, though not to the same extent, the demand not calling for it. Perhaps the most notable and successful of these further applications is a hard cast-iron, square, taper reamer about 6 inches long, ranging from ¾-inch to about ⅜-inch. This tool is ground up on an emery wheel, the large, straight end put in a drill chuck and set at work reaming out holes in thin cast-iron plates, doing work without trouble or fuss that no self-respecting steel drill would stand for a moment.

The weight-feed used on the milling machine helps the operation of the tools very materially, giving with the motion of the cutters yet keeping an even tension on the work until the stop is reached. The adjustment of the cutters is secured in the simplest way possible, washers or collars of different thickness being provided to put between them, paper washers being added to get close adjustment. Whether the operation of the tools after they become a trifle worn be called cutting or grinding, these cutters have a lasting and "get there" quality that is decidedly refreshing.

It would be interesting to know how far this idea can be carried to advantage. Certainly, in view of the example described above, it is not impossible but that "there are others." If so it is to be hoped your readers may hear from some of your corespondents who may know of them.

[It is of course impossible to show the character of the workmanship on the butt by a picture, but it is all that could be asked and better than needed for the purpose. The joint does not move with absolute smoothness, but nearly so. At one point a slight shake can be just felt—not, we should say, exceeding 1-1000 inch. Next!—Ed.]

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A Miniature Railroad.

John W. Shriver, a young man, partially crippled and now living in Denver, Col., has built a diminutive practical locomotive, or, in fact, we might say a complete railroad. It is now running and carrying children every day. The engine weighs 450 pounds. Its length, with tender, is 6 feet 7½ inches. The cylinders are 1½ inches diameter by 2½ inches stroke, and the driving wheels 8 inches diameter. The entire train, consisting of engine, tender, four observation cars, box car and caboose, is 29 feet long. The tender carries 6 gallons of water, and with 5 gallons in the boiler, the engine can run two hours without replenishing. Coal is burnt, as in the standard locomotives. This little train is to be a feature of the Trans-Mississippi Exposition at Omaha, Neb., next year, which has been previously noticed in our columns.

The Construction of Armature Coils.

BY WM. BAXTER, JR.

The coils of multipolar armatures are, as a rule, built up on separate forms, and are then mounted in their proper position on the core, and strongly secured in place. In order to accomplish this successfully, it is necessary that the coils be all of one shape, and that shape the proper one. It is easy to see that we can place a coil of almost any shape upon the core of an armature and fit another alongside of it, and possibly a third one against the second, and a fourth one against the third; but if the first one is not of the proper shape, the second one will be still less so, and each succeeding one will be more out than its predecessor; therefore, by the time five or six are in place, the space will be so much encroached upon that there will be no room for any more. It is therefore necessary to first decide what the proper shape is, and then to devise means for making all the coils alike. There are two ways in which the coils may be laid upon the core; one is, to have them wholly upon the cylindrical surface, and the other, to have the ends turn down toward the shaft. Fig. 1 shows the form of coil when the ends are on the cylindrical surface, and Fig. 3 the form when the ends bend down. In Fig. 1, *B* shows a top view, and *A* an end view. It will be noticed that where the coil turns, it is at right angles with the other part, as shown at *C*. In some cases this arrangement is modified by having the turn run on a slant, as shown at *C* in Fig. 2.

In Fig. 3, which shows a coil with the ends bent down, *B* is a side view, and *A* an end view. Coils of this kind can be made so as to be placed upon the armature with one side in one layer and the other in another, or they may have both sides in the same layer. With the coil shown in Figs. 1 and 2, one side must be in a layer under the other, as can readily be seen. Fig. 3 shows the form of coil when both sides are to occupy positions in the same layer, and Fig. 4 the shape when each side is to be located in a different layer. Both these figures show the coil with the sides in the same plane as in Figs. 5 and 6, and therefore are not true representations of the end view *A*, but show the appearance of the coil when closed up like a fan.

The ends *E* of the coils in Figs. 5 and 6 can be made slanting, the same as in Fig. 2; but in both forms this position of the end renders the construction somewhat more difficult.

If the machine is of large size, the coil is usually composed of a single turn, and is then made of a rod of square or rectangular shape; but in small machines, each coil may have anywhere from four to sixteen or more turns of wire, varying in size from No. 9 or 10 to 15, or even finer. The methods of construction and forms

here explained are intended for coils of the latter class, in which the wire is not larger than No. 9.

If it desired to construct a coil of the type shown in Fig. 1, we start by winding the wire in a long loop, as shown in Fig. 8, the length being such that when bent into the proper shape it will be the required size. To form it the ends marked *C* in Fig. 1 are secured in clamps, arranged to slide toward each other, but not to turn in any other direction. The sides are then caught at the points *D* and are drawn

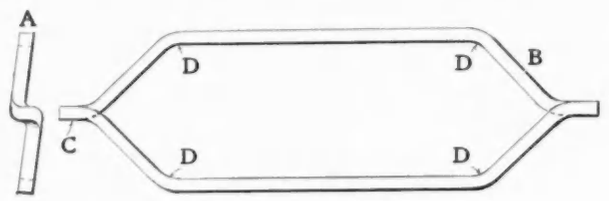

Fig. 1

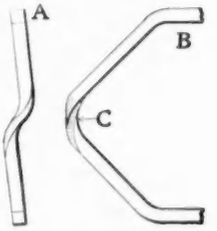

Fig. 2

American Machinist

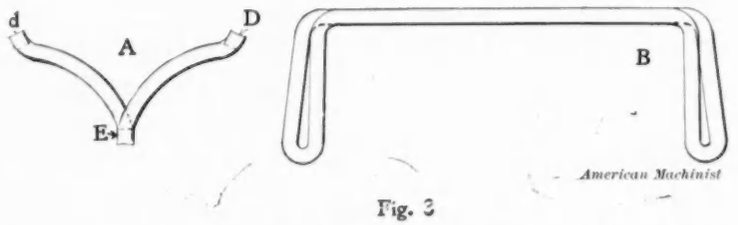

Fig. 3

apart to the proper width. In order that the wires may be able to slide freely upon each other without stretching, it is necessary that they remain unvarnished until after they are bent into the proper shape, but as loose wires wound in a coil of the form shown in Fig. 8 would not retain their places, it is also necessary to hold them temporarily with small clamps, placed as close together as may be required. These clamps can be made of

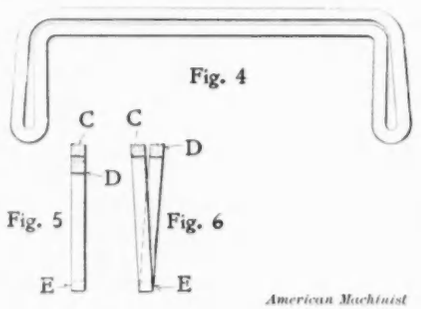

Fig. 4

Fig. 5 Fig. 6

hard wood, in the form of a *U* with a pin passing across the upper end to form the fourth side of the clamp. After the coil is bent into the proper form it should be saturated with shellac, a sufficient amount being used to stick the wires well together. After this it may be covered with an insulating tape, but it will make a more mechanical looking job to leave it bare and provide the necessary insulation upon the armature core, and in the shape of strips placed between the coils as they are assembled.

From the foregoing it can be seen that the form shown in Fig. 1 is easier to make than in Fig. 2, but the latter can be made by using a narrow clamp at the ends *C* and holding it so that it may revolve through a certain angle as the coil is spread out.

If it is desired to construct a coil with the ends bent down, as in Figs. 3 or 4, we start with a coil wound in the form of Figs. 7 or 8, according to whether we desire a coil with both sides in the same layer or not. If the armature core is smooth the whole surface will have to be covered with the coils, and to accomplish this without crowding the coils at the ends *E*, Fig. 3, both sides will have to rest in the same layer, that is directly upon the core. In such a case we will have to make the preliminary form of the coil as shown in Fig. 8. This can be bent into the form of Fig. 3 by pressing it down over the pins *P*, and looked at from the end it will be as in Fig. 6, the sides *C D* being the same distance from the end *E*.

If the coils are for a grooved core armature, one side will have to fill a position in one layer, and the other side a position in another layer directly over the first; that is, one side, say *D*, Fig. 5, will fill the lower half of a groove, and the other side *C* will fill the upper half of another groove, the lower half of which is filled by the side *D* of another coil. This shape coil, when bent into the form shown in Fig. 5 will present the appearance in side view, shown in Fig. 4. From this latter figure it can plainly be seen that the under side *D*, measured from the center of *E* at both sides is shorter than the upper side *C*, and if we were to straighten out the ends, we would obtain a coil of the form Fig. 7, instead of Fig. 8. From this we see that to make a coil for a grooved core we start with a form as in Fig. 7 and bend it over the pins *P* to the form Fig. 4. Fig. 8 therefore is the starting form for a coil for a smooth cored armature, and Fig. 7 the starting form for a coil for a grooved armature.

After the coil has been bent into the form of either Fig. 3 or 4 it can be spread to the form of *A*, Fig. 3, which is the shape it must have to fit in place in the armature by means of the device shown in Fig. 9.

This device can be easily constructed; it consists of two end forms *F* made of wood, and properly secured to a base. From one to the other of these ends a rod *C* is passed, which serves to hold and to guide levers *A B*, whose office is to head the sides of the coil. There should be two sets of these levers, one at

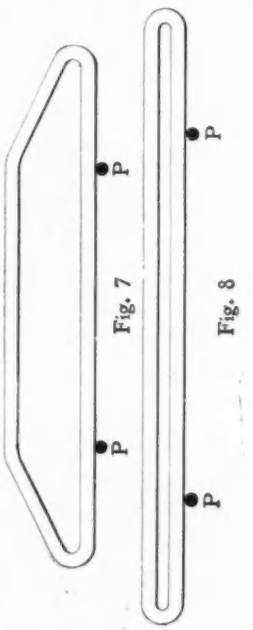

Fig. 7 Fig. 8

each end of the coil. Each one is secured to its proper side of the coil, and then the two are pressed out sideways into the positions *H K*, as shown by the dotted lines. The lower ends of these levers being held by the rod *C* must move in a line radial to it, therefore the sides of the coil held by the clamps attached to these levers will retain the radial position. The ends of the coil will be bent over the curved surfaces *S*, which will have to be slightly more curved than the coil is to be, so as to allow for the springing back of the wire. The levers *A B* must be slotted at the lower end, as the wire in bending swings around a centre a considerable distance above *C*.

To prevent the coil from being drawn out of place in the forms *F*, pins *P* are passed through the loop in the ends *E*. The lever *A* cannot very well slip off the coil if a downward pressure is exerted upon it in the act of bending; lever *B*, however, can slip off, and to prevent this it is necessary to use a pin *N* or some equivalent retaining device. As in this last operation, the only part of the wire that has to move is that which bends over the curves *S*. The balance of the coil can be stuck together with shellac before the bending is done, and in fact to do this will insure better results.

The sides *C D* of the coil, which rest in the grooves in the armature core, must be in a position radial with respect to the armature itself, therefore the rod *C*, Fig. 9 would be in a position corresponding with the centre of the armature shaft, if it were not for the fact that the wire will spring back a little as soon as the pressure of the clamp is removed. To allow for this spring the rod is lowered a trifle, and as the exact amount cannot be very well determined beforehand, it is best to make the construction such as to permit of some adjustment.

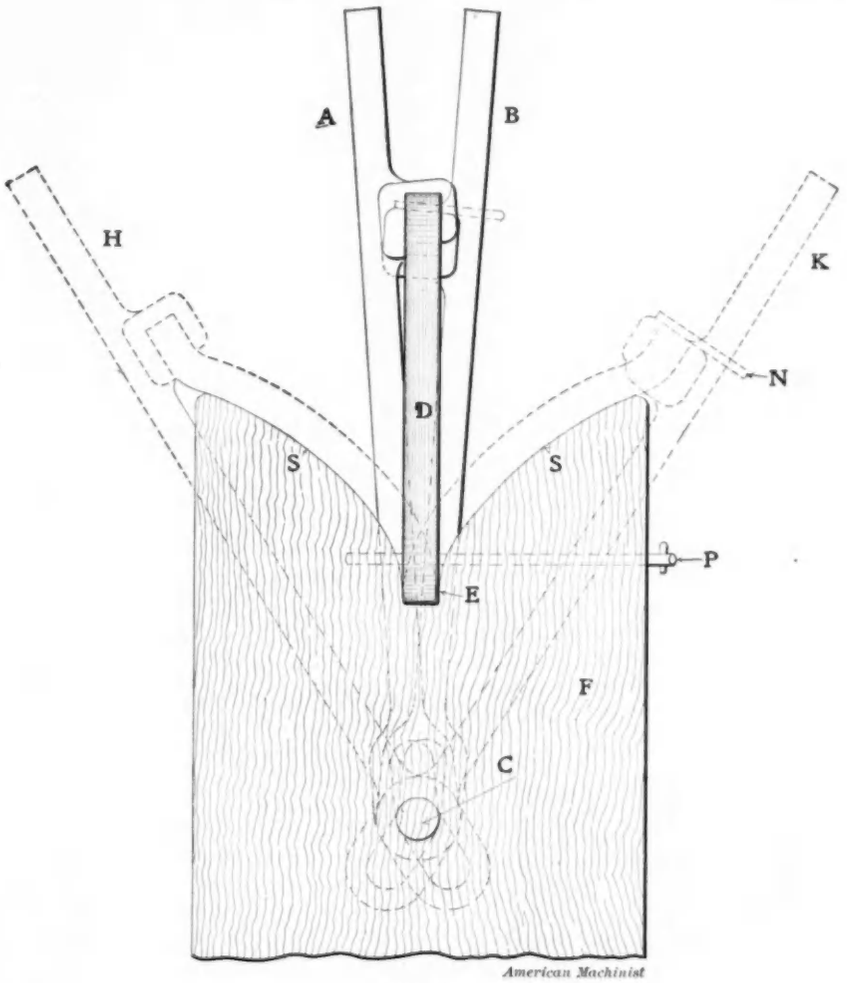

Fig. 9

As already stated, there should be two levers, *A* and *B*, so as to bend both ends of the coil at the same time, and these levers should be connected at a point near where they clamp the wire. This arrangement will not only enable one man to spread both sides of the coil at once, but it also prevents the clamp slipping off the wire, which it might otherwise do if not held tightly against the wire.

A little reflection will show that a device of this kind can be used to make coils of different size and shape, by simply providing means for adjustment at the necessary points. The curves *S* can be made detachable from the sides *F*, and by having a number of curves, the shape, as well as the spread of the coil, can be varied. By making the rod *C* movable vertically, coils can be bent to fit armatures of different diameters. The clamps on levers *A B* can be made separate, and so that they may be secured to the levers at any point that may be necessary. To provide for different lengths of coils the frames *F* can be made to move to or from each other on the base. Thus it will be seen that with a very slight elaboration one apparatus may be made to bend a great many different sizes as well as shapes of coils.

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Letters from Practical Men.

Elevating the Fireman.

Editor American Machinist:

Things have been going along of late with abnormal smoothness in the steam-engineering field. A portentous calm has hung over us, and we are beginning to see the significance of the indications. There has been a storm brewing. There has been a revolution impending, and now it is right upon us. The engineer has heretofore been the head of the steam plant, and the fireman has been his assistant and subordinate. The engineer has mostly monopolized the knowledge, the skill, the honors and the pay, while the fireman has had to take what was left. Evidently all this is going to be changed. The fireman is coming up. His position is, before long, going to demand more skill and more alert ingenuity than that of the engineer. If anyone doubts this, it is only necessary to look at the "Econometer" in the "American Machinist" of May 27th, and then at the new boiler-feeding arrangement in the June 17th issue. That last one is a dandy. If that does not raise the fireman's wages, then justice has perished from the earth.

I know the apparatus is "automatic," but I have seen automatic apparatus before. Automatic is a very catching word with buyers, because anything that works automatically does it all itself, you know; and, of course, labor is saved—when the thing works. Sometimes automatic things don't work, and then, of course, if anything happens they are to blame. It used to be pretty well agreed that low water and boiler explosions were nearly related; but lately it seems to be questioned whether they have any connection. But suppose that low water should occur and that a boiler should blow up in consequence in the old-fashioned and traditional way with one of these automatic feeders on; we can imagine a jury of experts gravely bringing in a verdict that the deceased came to his death on account of a lack of equality in the equalizer pipe, or too great a difference in the differential valve, or from the irregularity of the regulating valve, or because the relief valve failed to relieve, or by the collusion of any two or more of the baker's dozen of valves shown in the cut.

For care required in adjustment, and especially for the watchfulness required against derangement or failure to perform its functions, and more particularly for the difficulty in finding out what was the matter when it failed, a Corliss automatic engine would be a child's toy beside it. If an automatic low-water alarm was ever imperatively needed it would be in connection with that feeder. Deliver me from automatic devices that need constant watching. They are worse than useless.

A pump and try cocks, the primitive rig, has not been much improved upon for safety, after all; but for convenience lots of devices have come up. One thing is always true concerning them—the simpler they are the better, and their value is almost always in direct proportion to their simplicity. The glass water gage is valuable because it is simple. Thirteen is an unlucky number anyway, and a rig with thirteen valves to it and an equal number of different pipes cannot be compared with the many simpler means of boiler feeding. If the apparatus will help to advance firemen's wages, it will be doing one good thing; but if it will not do that, I can't see what it is good for.

TECUMSEH SWIFT.

That Difficult Casting.

Editor American Machinist:

The article by Mr. L. C. Jewett on "A Difficult Casting," in "American Machinist" of 10th inst., aside from the iron mixture, is somewhat misleading and absurd. The man who designed that casting likely designed what he wanted. However that may be, the sketch shows nothing that it is not entirely practicable to produce in the foundry. Mr. Jewett betrays an objection to do what is required, and proposes to do a great deal more work to produce something which is not wanted. He seems to be, like many others, afflicted with the too much rigging malady. Rigging that is fully up to its purpose is a great help in a foundry, but the practical limit is too often crossed. The outside diameter of a 1-inch pipe is large enough to allow a good smooth cored hole 1 inch diameter, and anyone who cannot make a core of that size and have the gas escape freely, has much to learn about the founder's craft. When it is considered that the lift on such a core is less than three-quarters of a pound per inch of top surface, it will readily be seen by thorough foundrymen that a few straight rods crossed in such a core would amply strengthen it, and it would be in no way necessary to make "opening" in casting to get them out. That "skeleton for core" looks very nice as a picture, and with the addition of some kind of a center of revolution it might be useful for a reel or the like; but in such a core it has no call.

Mr. Jewett says, "The trouble with this kind of casting is that the designer, proprietor and foreman of the machine shop, one and all, will let the foundry lose castings, pile on pile, rather than make reasonable provision to let off vent." I cannot agree with him. During my observation, nearly all the losses have been from wrong methods in the foundry. The principal reason that proprietors let the foundry lose "pile on pile" of castings is because they are the victims of misplaced confidence, taking too much stock in the blowing foreman, and realizing too little the real cause of blows in the castings. The torturing lack of sense which many so-called foremen betray in regard to material and methods necessary to both molding and core-making, is remarkable. Mr. King does not state whether or not the core used was one of those very stocky kinds, such as are too often produced, in density very much like asphalt pavement. Nothing is said about the size of outlet core used or vent in same, or whether the metal entered the mold against the side of core opposite vent, which is a matter of some moment on this class of cores. To get that casting free from blows, it is necessary to use good open sand, with only enough stock—farinaceous matter—to hold it together, for the core. It should be thoroughly vented with cinders, and dry. When these points are carried out fully, bad castings will be the result of some other cause.

This seems to be only another case where too little judgment has been used about the core, while that particular core requires as much skill to make as the mold. The drawing shows thickness of metal sufficient to give trouble, on that class of work, under high pressure, from porosity, unless very close metal is used, and especial care is taken to overcome shrinkage, which is a source of considerable trouble on refrigerating work, while on many other classes of work, though much heavier, it is not noticed, and many times not even supposed to exist.

HENRY O'NEIL.

Dover, N. H.

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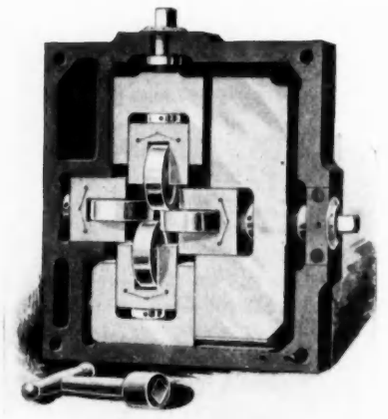
Adjustable Draw Plate.

Editor American Machinist:

I send you cut of an adjustable drawplate, or, as the boys in the shop call it, a "Turk's head," that may interest some of your readers who aspire to own a rolling mill, but who do not feel like investing the necessary capital to purchase the same. It is not intended to take the place of the mills for bar iron, as in use at the Carnegie Works; but it is designed to do a large range of drawing and rolling square or flat wire in brass, silver or gold, and by grinding the rolls of the proper shape, it can be used on half-round wire as well. It will take any size of square or flat wire up to the width of the rolls,



which are adjusted by screws, as shown on the top and side, and which are provided with micrometer graduations, so that when a number of pieces are wanted of the same size, it is only necessary to draw one piece, and note where the dials are set, and then return them to the same place when taking the finishing strain, and the lot will come alike.

The half-tone shows the internal construction of the plate and the manner in which the rolls are made and adjusted, the rolls and screws being contained in a housing that is so arranged that no matter what size or shape of stock is being rolled, they retain the same relative position to each other; that is, the roll that forms the top bar is always kept close against the roll that forms the side of the bar. This calls for a special construction of the sides, and which is very ingeniously arranged by the mechanism shown. A flat plate, not shown, covers the whole, and is fastened by four countersunk screws at the corners. This plate or cover has a center hole for passing the wire through the rolls, and four slots where a pin wrench may be inserted for moving the jam nuts.

The plate is strong and well made, and is used on any ordinary draw bench. It can be used on iron or steel, as well as the softer metals. It is the invention of Mr. Frank Mossberg, superintendent of the Mossberg & Granville Manufacturing Company, Providence, R. I., and is manufactured by them in three sizes, taking from 0 to ¾ inch square.

J. L. LUCAS.

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Wood-Turning Tools.

Editor American Machinist:

In the issue of June 10th there appears a description of a method of turning "slim woodwork." In his sketches, your correspondent shows the well-known smoothing tool—the cutting edge being ground at a considerable angle—a tool extensively used, but entirely out of place in the pattern shop. For the job shown, a 2-inch paring chisel would be much better—would work easier and faster. The paring chisel should be used bevel side down, tipped slightly and handle carried back to give a shearing cut. If Mr. Newton will give his paring chisel a fair chance, I am very sure he will lay the tool shown in cut aside for trading purposes. Nebraska farms are rather expensive; "swap" it for a few elliptical gears. Also, turner's gouges should be ground straight across face—not rounded, as is so common—up to about 1¼ inches. One and a half inch and larger should be slightly concave, the corners of a 2-inch gouge standing about 1-16 inch ahead. Ground in this way, they will cut instead of scraping.

O. E. EVANS.

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"Data."

Editor American Machinist:

In a recent number of the "American Machinist" you register a most emphatic kick against the misuse of the word "data," and give several "horrible examples." If you should ever need another one, I would respectfully call your attention to the following, from the report of the Hartford meeting of the A. S. M. E., in the "American Machinist" of June 3d: "This valuable paper by Professor Barr represents a vast amount of labor, both in the collection of the data and in con-

densing and arranging *it* and putting *it* in form for presentation to the society."

J. F. BRADLEY.

Valparaiso, Ind.

["One on us." Habit is strong.—Ed.]

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English and American Lathes.

Editor American Machinist:

The letter of Mr. Sellers, in your issue of June 10th, on the above subject prompts me to call your attention to another point where the writer of the article in the "English Mechanic and World of Science" (May 14, 1897) has failed to state the real use of a feature which he says is peculiar to American lathes—the oil-pot on the tail stock. He says it is for oiling the mandrel or tail-stock spindle. The English method, where they have no oil-pots cast on, is to simply drop the oil on the mandrel, and run the latter in and out once or twice to distribute it. Perhaps the writer in question may be excused for his oversight if he has never read Chordal's description of his chalk-cup lathe, where the oil-pot and chalk-cup are shown to have originated under somewhat similar circumstances.

WALTER GRIBBEN.

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Molding Chemical Pans.

Editor American Machinist:

The drawings herewith shown are intended to describe a casting very often molded in loam, but which can be made equally as well in every particular, and much cheaper, by a process termed "skin-drying." It is called "skin-dried" in contradistinction to green sand because, after being molded, the surface must be dried by heat to fit it for casting, whereas the sand in the latter method can be used as it comes from its native bed.

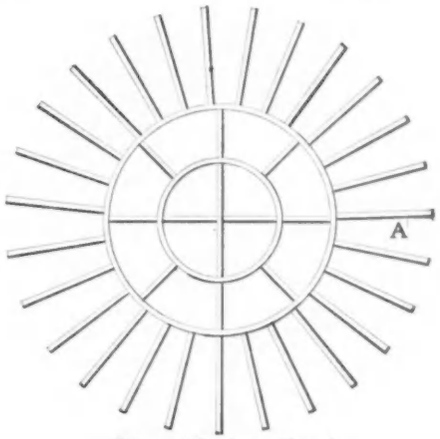
These pans are made by the use of sweeps, worked from a center spindle in the usual manner.

After the inside, or top sweep, has been used to form the mold, the cast iron basket A is lowered in and rested on the required number of blocks, said blocks being used for the purpose of keeping the basket up from the surface of the mold, so as to admit of tucking the bars. Hard wood, preferably 4 x 4, as shown in Fig. 1 at *B B*, is rammed up in course of the construction of the mold, so that after the cope is put on they can be wedged under the cope bars as seen at *O O*, thereby making the basket rigid with the lifting hooks *C C* are screwed up previous to lifting off the cope.

The pouring gates are "jogged" at *D D* so that the drop of the iron when the casting is being poured is not so great where the iron enters the mold, as it would be if the gates were straight, thereby lessening the liability of damaging the surface of the mold. Four cast iron girders, a section of which is shown at *E E*, Fig. 1, are used to secure the cope on to a top bolting-down floor, the girders of course being put on the cope in the opposite direction to the way they are shown in the drawing, which admits of the bars being wedged.

Any part of the molding process not here explained will be readily understood by referring to Fig. 1.

These pans weigh about 2,500 pounds, and all the cleaning necessary on the casting, when taken from the sand, is to chip the fin on the outside edge of flange and sweep off with a broom.



Plan of Basket.—Fig. 2

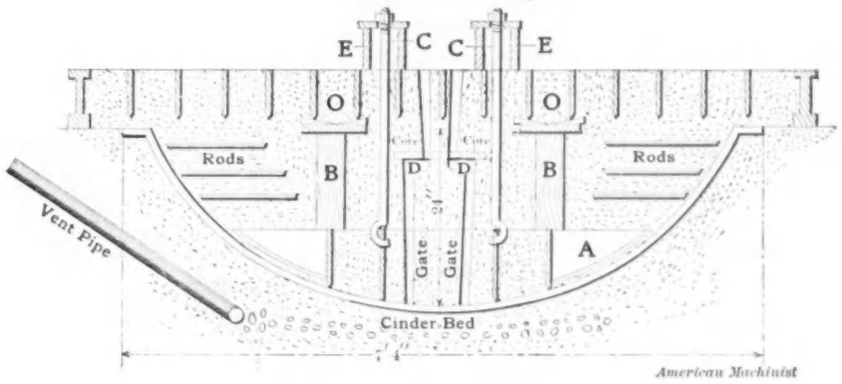


Fig. 1.—Section of Mold

They peel as nicely as though cast in loam or dry sand.

Fig. 2 shows plan of cast iron basket *A*. The writer having had considerable experience in this particular branch of the molder's art, would like to add, that judging from the few articles he has read on skin-dried molding, the authors were inclined to convey the idea that much judgment is required in molding, and that the chances for bad results are numerous. The writer's experience in this line of work has been to the contrary. We have had molders make first-class castings by skin-drying, that would have all sorts of trouble on green sand work, simply because it does not require the skill to successfully ram and vent a skin-dried mold that it does to produce good castings in green sand; consequently the extra cost of drying the mold, in a great many cases, is more than offset by the speed in which a skin-dried mold may be rammed up. Where surface nailing has to be resorted to in skin-dried molds, generally speaking, it is safe to say that the sand mixture is at fault. The cost of skin-drying such a mold as the one referred to does not exceed twenty-five cents in this locality, where charcoal is cheap. In regard to the best method of blackening a skin-dried mold, we think the better plan is to rub the blackening on dry by hand and then go over the mold with molasses water, using a camel's hair brush, which is preferable to slicking.

The humidity of the facing sand for skin-dried work should be about the same as is used for green sand work. Molding sand to be of the right nature, for the purpose named, should bake well, that is it should show no tendency to crumble, or flake off. The following sand mixtures can be depended on to give the very best results, both as to baking and venting free:

10 shovels Gulick's coarse "B" grade, new molding sand.

10 shovels old heap sand.

5 shovels fire sand.

1 to 14 shovels sea coal.

1 to 20 shovels flour.

Wet with thin clay wash. The grade of molding sand mentioned above is procured from Riverside, Pa., and is the best sand the writer ever used for skin-dried molds.

GEO. O. VAIR.

Corning, N. Y.

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Bringing Men Together.

England's "Grand Old Man" has lately made perhaps one of his most suggestive addresses, upon the occasion of the opening of a bridge across the River Dee. The fact that the bridge is named the Victoria Jubilee Bridge no doubt gave direction to the address, and its keynote is found in the following sentence:

"When the history of the nineteenth century is told, the historian will always regard it as among the most prominent features of that period, that it was busied, and busied with an extraordinary success, in studying and in improving the communication between the different portions, first of all of this community in the several parts of this island, and secondly of the different races of mankind."

Mr. Gladstone, born in 1809, rightly calls himself a man of the nineteenth century, and then he says: "It is hardly possible to describe the change that has taken place within my recollection so far as regards the increased facilities of communication between man and man all over the world and all over the country. I thank God for it, and regard it as an immense blessing."

It is easy enough to enumerate some of the particular appliances which have been instrumental in promoting and facilitating human intercourse; it is not easy to estimate or to overestimate the changes, overwhelmingly for good, which they have accomplished. The distinct creations of the nineteenth century, which we have now acquired the habit of enumerating in this line, are cheap postage, railroads, steamships, the telegraph and the telephone, and Mr. Gladstone now very properly adds the bicycle, saying of it, rather guardedly: "That is a very singular development of our time, and I suppose, upon the whole, a very valuable one." The trolley car, urban and suburban, should also in justice be added to the list, because it is of recent birth, and because the term railroad does not seem to include or suggest it.

The newspaper was born before the century, and had begun its beneficent work in a small way. The technical or trade paper belongs distinctly to the century, and almost entirely to the latter half of the century. It is by no means to be omitted in any exhaustive enumeration of the active means of communication between men. So far from that, it is easier to believe it the most potent agency as yet developed. Our own journal is the growth of the last quarter of the century, and necessarily represents and embodies the latest and best means for communication. Our field is not the whole range of human thought and activity. We belong especially to the shop, and we deal with its immediate environments and associations. We handle especially the most advanced ideas and the latest information as to shop methods and practices, and we chronicle the latest shop achievements. We have put into practical and effective operation more completely than any other journal this idea not only of the communication, but of the intercommunication of men of kindred pursuits. Our journal has been more than a mere gatherer of information and a dispenser of the same. It has not been merely a preacher or a teacher dealing out its hebdomadal batch, but has furnished both the stimulus and the arena for suggestive and profitable discussion. Ideas grow as the snowball when it is rolled over the new clothed field. Our "Letters from Practical Men" have been from the first a valuable feature, and their influence and importance continues. It is a great thing to bring men together; misunderstandings are dissipated, mutual respect is promoted; in the giving and taking of ideas each is enriched, the sum total of human knowledge is augmented, and the standard of achievement is continually advanced.

After Pine, What?

There are those who, judged by their talk, pass sleepless nights over the question of what is to become of the human race when all the coal beds are exhausted. The question is well deserving of occasional serious thought, but there are others more imminent, if not of as great magnitude. The machinist of course depends mostly upon the supply of coal and the metals for his continued activity, but where is the machinist who is not more or less intimately tied to the patternmaker and how can the patternmaker continue his existence without an unfailing supply of pine lumber?

The Chief of the Division of Forestry of the Department of Agriculture makes a report upon the visible supply and the rate of consumption of white pine that is rather startling. "At last the end is visible, and even the most sanguine can not longer hide the truth that within the next decade we shall witness the practical exhaustion of this greatest staple of our lumber market." "While white pine will be cut in the United States for many decades, as owners of the stumpage control their holdings, the enormous amounts which have hitherto been cut annually can not be had beyond the next five or six years, even with Canada to help in eking out our deficiencies."

Since 1873, 165,000,000,000 feet, board measure, of white pine have been cut in the three States of Michigan, Wisconsin and Minnesota, and with what has been cut in the other States the total must be over 200,000,000,000 feet, and to maintain the consumption thus indicated 20,000,000 acres of well stocked and well kept pine forest would be required. The consumption of coniferous wood in the United States seems to be something over 400 feet per capita, while in England it is but one-third of that, and in Germany it is below 150 feet, so that it is possible to considerably reduce our consumption. "Our virgin coniferous supplies must share the fate which the buffalo has experienced, unless a practical application of rational forestry methods and a more economic use of supplies is soon inaugurated. Since coniferous wood represents two-thirds to three-fourths of our entire lumber wood consumption, and its reproduction requires more care and longer time than that of hard wood, the urgency of changing methods in use and treatment must be apparent."

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Technical Books.

"Mechanical Refrigeration and Ice Making. The De La Vergne Refrigerating Machine Company, New York, 1897. A satisfied customer is the best advertisement." The above is upon the cover, and is honestly representative of what is put forth as the fifth edition of the catalog of the De La Vergne Company. We could not in common justice put this

work in our usual list of trade catalogs. The book is a valuable publication containing an exposition of the principles of mechanical refrigeration and descriptions of the latest improved devices and arrangements for the purpose. Special prominence is given to the comparatively new departure in ice-making for the indoor, all the year round skating rink. A notable chapter of the book is that upon Insulation. It should be valuable to steam users, as well as others, as the same means are effective in keeping heat in as in keeping it out. The book contains a number of valuable tables, fully and carefully indexed, and is, in every particular a beautiful example of the printer's and engraver's arts.

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Questions and Answers.

Name and address of writer must accompany every question. Questions must pertain to our specialties and be of general interest. We cannot undertake to answer questions by mail.

(100) "Practical," Birmingham, Ala., asks: In cutting key-seats in shafts or in wheel hubs, is it proper to measure the depth at the side of the key-seat or in the middle? A.—It is largely a matter of taste. We would measure the depth at the sides; that is the most convenient way, and is also undoubtedly the most common practice.

(101) T. L. K., Evansville, Ind., asks: What is the correct pitch to the foot for a tug-boat shaft, and why do propeller shafts pitch down from the engines? A.—There is no "correct" pitch, and in many cases there is no pitch. In the United States Revenue Cutters, in our issue of April 15th, the wheel end of the shaft is higher than the crank end. It depends upon the model of the hull and the dimensions of wheel and crank. The practice usually is to set the engine as low as possible, allowing room for the crank to turn, and then, if that is not low enough for the proper submergence of the wheel, to pitch the shaft down.

(102) M. L. R., Ohio, asks: What machine shop pays the highest wages for common machine work, and what shop pays the lowest wages; also, what shop runs the most steadily, or has the least lost time? A.—As a matter of fact, we do not know at the present time what wages are paid in any shop in the United States, and while we could obtain some information in this line, most firms would object to its publication, especially those who are paying the lowest wages. Most shops run all day and every day in the year, except Sundays and legal holidays; although the number of men employed must vary with the state of business.

(103) F. J., N. Y., writes: I am experimenting on a horseless motor; can you give me any information as to how to construct a vaporizer, one for kerosine and gasoline? A.—It would be useless to attempt to describe a vaporizer alone. The difference in the volatility of gasoline and kerosine would not allow of the use of the same arrangement for both. It would be well to look up some of the many ways of using the vapor of gasoline or petroleum oil in internal combustion engines. The mixture of air and vapor is accomplished in various ways, "either by passing the air through the liquid, or over a surface largely extended by capillary attraction of the fluid by fibrous surfaces dipping into the liquid, by vaporizing the liquid by the heat of the exhaust, or by injecting the liquid in small portions into the air-inlet chamber or under its valve, or directly into the clearance space of the cylinder"; thus the majority of the engines do not use a "vaporizer." See "Gas, Gasoline and Oil Engines," by G. D. Hiscox.

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American Goods Permanent Exhibition in Venezuela.

There is about to be established in Caracas, the capital of Venezuela, a sample warehouse for the display of American goods. The undertaking is to be under the auspices of the National Association of Manufacturers, its aim being, of course, to stimulate trade. Goods will be entered free of duty, which is only to be paid as actual sales are made. This is to be the first of an extensive system of similar depots which the National Association of Manufacturers contemplates establishing in various foreign trade centres. It is not intended that these establishments shall be operated with any view to profit, but only that they shall be self-sustaining, and the charges will be made upon that basis.

The circular of the N. A. of M., from which we obtain our information, remarks as follows the trade possibilities in Venezuela:

"It is a recognized fact that the average standard of living is higher in Venezuela than in any of the other South American countries, which is borne out by the relatively high cost of living, especially in Caracas.

"The Venezulans are known to travel more extensively than the people of any other part of Latin America. They are cultured in their tastes and wants; hence Venezula is a good market not only for the ordinary staple goods, but especially the numerous articles, which constitute the luxuries and comforts of life, and which, in the United States, have come to be regarded as necessities.

"While most of the Latin-American countries practically have no stable currency, Venezuela justly prides herself on possessing a currency that is equal to that of the most advanced nations. The law establishes the rate of exchange for foreign gold coins, from which there is practically no variation.

"Business is conducted on a sound, conservative basis, failures are most extraordinary occurrences, and in the majority of cases the leading houses are very wealthy concerns, which have been established in some cases for several generations.

"Through their direct representation in Caracas and other Venezuelan cities, the Germans, English, French and Belgians control a large volume of trade which ought naturally to come to the United States. The facilities of the Caracas warehouse of the National Association of Manufacturers will afford to American manufacturers opportunities for direct representation and intimate contact with the merchants of Venezuela, which have never existed heretofore."

The headquarters of the N. A. of M. are at 1751 North Fourth street, Philadelphia.

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Selling Shop Secrets.

A suit involving points of interest to manufacturing firms has been brought in the United States Circuit Court at Cincinnati by the Walker Company, of Cleveland, against W. H. Bone & R. T. Bone, the former being the acing secretary and manager of the company, and the latter the assistant manager.

The company declares that the defendants were employés of the Walker Manufacturing Company, and after the organization of the Walker Company they were continued in the employ of the new company at large salaries, and that they are the custodians of valuable papers, plans, etc., containing secrets of their business. These plans, it is averred, cost the Walker Company in excess of $50,000, and are of immense value in the business in the manufacture of electric motors, etc. The company then goes on to say that the defendants, acting in connection with other parties, whom the company believes to be competitors in business, have been taking copies of plans, specifications, data, figures, and practically all of the valuable secret equipment and business of the Walker Company. "The defendants have been secretly carrying on their plans in connection with other employés and with the knowledge of parties not in the employ of the plaintiff. They have continually been carrying away tracings and drawings used in the business, contemplating to deliver such. The defendants are contemplating quitting the employment of the plaintiff and using or disposing of the plans, which information they have acquired only by means of their employment in the service of the plaintiff. This information is secret, valuable and confidential.

"The plaintiff believes and is informed that they have in the day and night time entered the works and carried away property, the full extent of which is not known. They have copied or duplicated these plans, returning the originals to their place."

"At any day they are liable to leave the employment of the plaintiff and carry away the paraphernalia which they have gathered and concealed. If unrestrained they may deliver to the competitors these plans. They propose for their benefit to make such use of the plans and to dispose of them."

The temporary restraining order prevents the delivering of any of these plans or duplicates to any party, association, combination, firm or corporation.

After the hearing in the case a per-

petual injunction is desired and the return of the plans and duplicates alleged to have been copied.

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Death of De Volson Wood.

Prof. De Volson Wood, of the Stevens Institute of Technology, died June 27th, after a week's acute illness. Prof. Wood was born in Smyrna, N. Y., 1832, graduated from the Albany Normal School and began teaching there in 1853. He received the degree of C. E. in the Rensselaer Polytechnic Institute in 1857. He was Professor of Civil Engineering at the University of Michigan fifteen years, and was connected with the Stevens Institute twenty-six years, first in the chair of Mathematics and for the greater portion of the time in the chair of Mechanical Engineering. Prof. Wood early became interested in and contributed to the development of the rock drill, especially at the Hoosick Tunnel and the New York Aqueduct, many of the drills being employed upon the latter work. He was the author of many valuable text books, and was the first president of the Society for the Promotion of Engineering Education. He was an active and valued member of the American Society of Mechanical Engineers, and had been vice-president of the society. He was also a member of the American Society of Civil Engineers and of the American Association for the Advancement of Science. He at various times contributed valuable matter to our columns. Personally, Prof. Wood possessed a remarkable simplicity and uprightness of character, with a genial and kindly disposition which could convert the hours spent in his class-room over subjects in their nature among the most difficult and irksome, into a time to be associated with pleasant memories.

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Personal.

On Thursday, June 24th, Mr. Lucian Sharpe, president and treasurer of Brown & Sharpe Manufacturing Company, accompanied by his son Lucian Sharpe, Jr., sailed for Europe on a few weeks' business trip.

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In Kansas City recently the cable attached to the weight of the striking apparatus of the clock in the post-office building broke, and the weight, 2,500 pounds, crushed through two floors. The cable is said to have been but 5-16-inch diameter.

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Five hundred automobile cabs are just beginning to run in Paris. They include experimental vehicles built upon nearly every variety of design and almost every known system of mechanical traction. It is estimated that 1,500 automobile vehicles are now running in Paris.

Commercial Review.

NEW YORK, Saturday Evening, June 26.

THE GENERAL OUTLOOK.

The two principal business agency reports are at odds this week. Bradstreet is bearish and says that the state of trade has been persistently misrepresented during the past month, though he looks for a revival of demand in the fall; while the rival oracle, Dun, is determined to maintain his bold position as to the present.

A Wall street man remarked to us yesterday that not only does the stock market exhibit more activity, but that this is an activity of a healthy character. Stocks are actually being absorbed, whereas six months ago it was merely a pitch and toss between the brokers to see who could make a living. A landholder in Washington State, or thereabouts, incidentally remarked our informant, had just announced his desire to erect some brick houses in preparation for the boom in business which he felt certain was soon to sweep over that part of the country. A little visionary on his part, one may think, yet if everyone, machinery buyers included, were as much so, and as ready to act upon the faith of their visions, the business boom would be here, and no mistake.

Pig iron has advanced, and one of the brokerage firms which handle the largest quantities of it, stated on Monday that their sales had quadrupled within a month. An attempt has been made to advance bar iron 5 cents per cwt.

DYNAMO NOTES.

At the annual meeting of the Westinghouse Electric and Manufacturing Company, Wednesday, it was announced that a contract for 75,000 horse-power of electrical generators for the St. Lawrence Construction Company, of New York, and involving nearly a million dollars, had been secured by them. They will, in consequence, run their works with an increased force for some time to come.

The University of Michigan, Ann Arbor, will install an electric light and power plant, consisting of two 75 kilowatt generators and two 120 horse-power engines. The connection will be direct, by

(Continued on page 35.)

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Business Specials.

Gear wheels, gear cutting. Grant; see page 16.

Forming Lathes. Mer. Mach. Tool Co., Meriden, Ct.

Engine Castings ⅛ to 2 H. P. Finished boilers and engines. Grant Sipp, Paterson, N. J.

"Modern Steam Engine Construction," parts 1 to 10; 30 cents each. T. F. Scheffler, Erie, Pa.

Standards—See adv. AM. MACH. June 24. Send 3c. First five sheets. R. Fortune, 267 24 St., Detroit, M.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., N. Y.

Gear and milling cutters, adjust. reamers, counterbars and tools, vert. millers, drill pr., cutter and surf. grind., shears. R. M. Clough, New Haven, Ct.

For Sale—One 18" x 36" Wright engine; 1 12" x 24" slide valve engine; lot of Brown shafting hangers, pulleys, belting, 12", 17" and 22". Fogarty Co., 84 Sedgwick Street, Brooklyn, N. Y.

Cost of Manufacturing—Experienced manager will establish system of costs, giving exact account of every detail. Charge based on saving effected. Correspondence solicited. Geo. C. Thomas, 99 Nassau Street, New York, Room 212.

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Wants.

Situations and Help Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. The Cash and Copy should be sent to reach us not later than Saturday Morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Situations Wanted.

Expd. ptn. mkr., German, wants wk. 80, AM. MACH.

Pattern maker wants work. A. Maag, 153 South Second Street, Brooklyn, E. D., N. Y.

Machine Designer wants pos.; last engaged in steel ball making machinery. Box 76. AM. MACH.

Mech. draftsman, 3½ years office, 4 years shop; auto. and gen. mach. Box 59, AMER. MACHINIST.

Wanted—Travelling position, mch. tools, machinists' supplies or steel. Box 77, AMER. MACHINIST

Draftsman, experienced, all-round mechanic; moderate salary; desires pos. Box 79. AM. MACH.

Machine designer, tech. graduate, 6 years' exp.; wants to change. Address Box 3, AM. MACHINIST.

Wanted—Situation by experienced foundry foreman: up to date and progressive in modern foundry practice; results assured; no experiment; references. Box 75, AMERICAN MACHINIST.

Wanted—Position as assistant to mechanical engineer or superintendent by energetic young man' expert machinist. Have technical education. City or country. Box 72, AMERICAN MACHINIST.

Machinist, first-class tool maker and general machinist, milling machine, tool and fixtures, gear cutting models; experience as foreman of tool rooms. Address Box 78, AMERICAN MACHINIST.

Europe—M. E. and E. E. and prac. mach., speaks Eng., German, French, would travel Europe for tool mach'y as representative or expert. 20 years experience. Best references. Box 73, AM. MACH.

Experienced designer and practical mechanic desires sit.; well up in mod. meth. of doing good work at commercial profitable basis; held positions as assist. supt. and chief draftsman Box 68, AM. MACH.

Change wanted about the first of September by successful supt. with 20 years' experience on wide range of work. Member A. S. M. E. Gold plate references. Address Box 69, AMERICAN MACHINIST.

Responsible position wanted by an experienced machinist and draftsman, foremanship preferred; have held positions as general foreman for years. Can give best of references. Box 40, AMER. MACH.

An M. E. twenty years successful experience in management of help desires to make a change, Supt. or Master Mechanic. Electrical work, metal goods, bicycle work. Estimates; special tools and machinery, designing, etc. Box 74, AM. MACH.

A successful mechanical superintendent is open to an engagement; familiar with brass and iron work, interchangeable work, tools, gauges, etc., general machinery and tools, and up-to-date shop and office management. Box 39, AMERICAN MACHINIST.

Help Wanted.

Wanted—A first class man to run a universal milling machine on tool and miscellaneous work; only those with the best of references need apply to C. P., Beverly, Mass.

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Miscellaneous Wants.

Advertisements will be inserted under this head at 30 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue Answers addressed to our care will be forwarded.

Cheap 2d h'd lathes & planers. S.M. York, Clev'd, O.

Calipers & Gauges. F.A. Welles, Milwaukee, Wis.

The Dutton Wet Twist Drill Grinder is sold by the Garvin Machine Co., New York City.

Best and cheapest Bolt Header, made by Baush & Harris Machine Tool Co., Springfield, Mass.

Wanted—Iron planer, second hand, about 28" x 28" x 6'; state prices. H. L. McCullough, Cropsey, Ill.

Light and fine mach'y to order; models and electrical work specialty. E. O. Chase, Newark, N. J.

For Sale—Second-hand drill presses, engine lathes & planers. Dietz, Schumacher & Boye, Cincinnati, O.

(Continued on page 35.)

(Continued from page 34.)

the Arnold system, so as to drive either or both dynamos with either engine. Specifications having only just been sent out, there may yet be time for some of our electrical readers to obtain them, if they have not already done so, and to bid on the contract.

A proceeding which may prove of much commercial importance in the electrical world is a consolidation which has taken place between the Siemens-Halske Electrical Company, which was organized in Chicago soon after the World's Fair, and the Pennsylvania Iron Works, of Philadelphia, which manufacture cable railway machinery, winding and driving machinery and gas and steam engines. The two companies, whose capital aggregates $3,250,000, will thus be enabled completely to equip street railroads with either cable or electric machinery. The consolition is a part of a scheme of the street railway capitalist, Chas. T. Yerkes, of Chicago, president of the Siemens-Halske Company, to effect a monopoly of the manufacture of the machinery used by the street railroads of Chicago, New York, Philadelphia and Pittsburg. Almost simultaneously, comes the report from Chicago that a judicial decision just handed down seems indirectly to assure a consolidation of the street railway systems of Chicago under the name, Chicago Traction Company. There is also a project to unify the elevated roads of Chicago, two of which are owned by C. T. Yerkes.

MILL AND MACHINISTS' SUPPLIES

have not as yet derived much benefit from the "business improvement," if such we are justified in calling it. Doubtless it would be unreasonable to expect that they should. Dullness seems generally to be settling down, or rather remaining, upon this department of the market. We are approaching the summer stock-taking time, which is known to be instrumental in retarding the sale of this class of goods; which fact may be one cause of the quietness. It is agreeable to note, however, a few reports of improvement in the supply business—enough to show that the stronger feeling elsewhere prevailing has made an appreciable inroad into this department of the market.

The single favorable sign in the home market noted by one of the principal sellers of small tools and machinists' supplies is this: that several small jewelry manufacturing concerns in Newark, N. J., accustomed to buy such supplies as he has to sell, who generally shut down for a few weeks at this time of the year and were expecting to do so this year, have received enough orders to change their intention and keep them running.

Manufacturers of cast-iron pipe fittings, brass and iron body valves, cocks, etc., have withdrawn prices. This evidently means smaller discounts. From the standpoint of one of the larger wrought-iron

(Continued on page 36.)

MISCELLANEOUS WANTS—Continued.

Models and experimental work, special machinery, dies, tools, specialties. Welch & Hutchinson, 87-91 Pearl Street, Brooklyn, N. Y.

We make a specialty of Shartle's patent safety set collars. Prices low and samples free. Middletown Machine Co., Middletown, Ohio.

Patent Office practice, correspondence course of instruction for inventors and draftsmen. Address H. F. Noyes, 56 Liberty Street, New York.

Model Locomotives—Complete castings, latest N. Y. Cen. standard, up to date; 4c. in stamps for cat. alog. G. H. Olney, 163 Herkimer St., Brooklyn, N. Y.

Wanted—The address of every young man who wishes to study mechpnical engineering at a low cost. Mech. Dept., Agricultural College, P.O., Mich.

For Sale—Machine shop, with fine tools, milling machine, lathes, drills, etc.; doing a good business; best of reasons for selling. Address Box 71, AMERICAN MACHINIST.

Lathes, planers, drills, milling machines, vises, also brass working machinery second-hand; must be modern, cheap and in first-class condition. C. C. Wormer Machinery Co., Detroit, Mich.

For Sale—A small machine shop in a New England city; special machinery and tools. This is a good opportunity for some one with $3,000; poor health reason of selling. Address Box 60, AMERICAN MACHINIST.

Wanted Capital, $10,000—A one-half interest in an established machine tool company is offered a practical man having the executive ability to conduct the business. Strictly modern shop and equipment with ample orders. Address Box 49, AMERICAN MACHINIST.

A machine shop, with modern equipment, heavy and light machinery, cranes of 20 tons capacity and 10,000 square feet of unoccupied floor space, would contract to manufacture any kind of machinery. Parties already having machinery built under contract might do well to write us for estimates. Box 62, AMERICAN MACHINIST.

CAMS | **The Newark Machine Tool Works**
NEWARK, N. J.
Mill all kinds of Face and Cylinder Cams with perfect finish, no chatter marks and absolute accuracy, in any material. Cost low, for highest grade work.

BOOKS
FOR
Machinists, Engineers, Electricians
AND ALL PRACTICAL TRADES.

OUR large catalogue of practical books, embracing works on over fifty different subjects, is now ready for distribution, and will be sent prepaid to any address in the world.

NORMAN W. HENLEY & CO.,
15 Beekman St., New York.

RADIAL DRILLS

Wm. E. Gang & Co.
No. 1108 Harrison Ave.,
Cincinnati, Ohio, U.S.A.
Write for Circulars.

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Presses,
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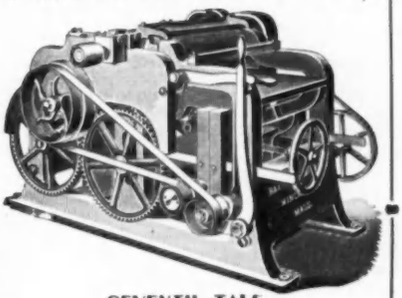
MOSSBERG & GRANVILLE MANUFACTURING CO.,
PROVIDENCE, R. I.,
MANUFACTURE A
SEMI-UNIVERSAL
MILLING MACHINE

Plane Tales From Whitney



SEVENTH TALE.
You would like to plane short pieces but your planer clips the ends. P-4 Planers will surface stock 3 inches long without clipping ends.

Baxter D. Whitney,
WINCHENDON, MASS.

(Continued from page 35.)

pipe companies, a better feeling in that line is reported.

Two of the principal concerns manufacturing and selling steam specialties, etc., when interrogated upon the subject alike testify to a quiet trade.

THE EXPORT MARKET.

A Liberty street house has just received from Brazil a $11,000 order for stocks, dies, wrenches, upright drills, etc.

The head of one of the largest local supply houses, who made a European tour last year and will start upon another in a few days, speaks with some enthusiasm as to the outlook for machine tools abroad: "You would imagine, would you not, from the number of American machines which have been shipped, that Europe must be flooded with them? Yet in such cities as Birmingham and Sheffield, and others, except in a few bicycle factories, American machines are a curiosity," said he, speaking presumably of the state of things observed last year. "The English prices for labor, lower than ours, are compensated for in manufacture by the superiority of the tools we build, and therefore these will find a good foreign market. The best way is to offer the machinery for sale through the agency of well-known foreign houses, rather than by individual representatives, because the purchasers in the former case feel that they are dealing with responsible parties and are willing to pay the round prices asked for good tools, in confidence that they are getting a profitable article. We are making as much effort with our foreign trade this year as last, and with about equal success."

A manufacturer of chucks, who has been seeking trade in England and France, remarks that the work done by him in that respect last year is bearing fruit this year.

Quotations.

NEW YORK, Monday, June 28.

Iron—American pig, tidewater delivery:

No. 1 foundry, Northern	$12 00 @ $12 50
No. 2 foundry, Northern	11 00 @ 11 25
No. 2 plain, Northern	10 50 @ 11 00
Gray forge, Northern	9 75 @ 10 25
No. 1 foundry, Southern	10 50 @ 10 75
No. 2 foundry, Southern	— @ 10 00
No. 3 foundry, Southern	9 75 @ 10 00
No. 1 soft, Southern	10 50 @ 11 00
No. 2 soft, Southern	10 00 @ 10 25
Foundry forge, or No. 4, South'n	9 50 @ 9 75

Bar Iron—Base—Mill price, in carloads, on dock: Common, 1.00 @ 1.05c.; refined, 1.10 @ 1.25c. Store prices: Common, 1.25 @ 1.35c.; refined, 1.35 @ 1.45c.

Tool Steel—Ordinary sizes, standard quality, 6 @ 7c., with some brands perhaps a little less; extra grades, 11 @ 12c.; special grades, 16c. and upward.

Machinery Steel — Ordinary brands, from store, in small lots, 1.50c.

Cold Rolled Steel Shafting—Base size, 2.40c., in small lots, from store.

Copper—Carload lots, Lake Superior ingot, 11.15 @ 11.25c.; electrolytic, 11 @ 11⅛c.; casting copper, 10¾ @ 11c.

Pig Lead—In carload lots, 3.60c., f. o. b., New York.

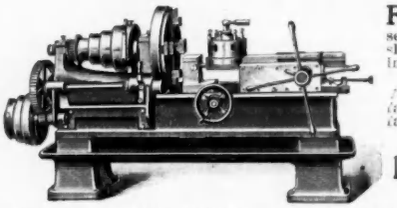
Pig Tin—For 5 and 10-ton lots, 14¼ @ 14½c., f. o. b.

Spelter—In carload lots, New York delivery, 4.25 @ 4.35c., f. o. b.

Antimony—6¾ @ 7½c., according to brand.

Lard Oil—Prime city, present make, commercial quality, in wholesale lots, 36 @ 37c.; 34 @ 35c. named on one brand.

FACING AND CHUCKING MACHINES.



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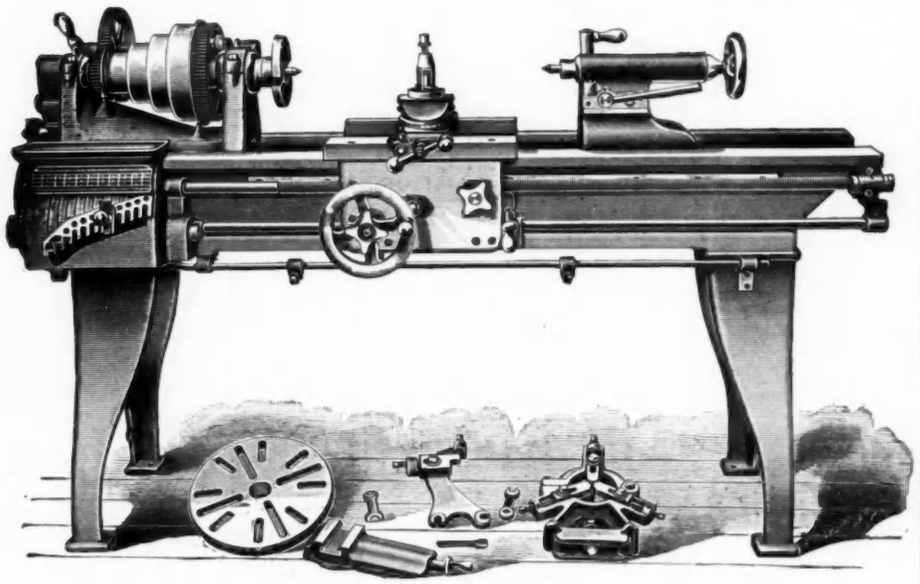

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We have received from the Manhattan Electrical Supply Company, of New York, a catalog of all kinds of electrical supplies. The catalog is 5½ x 7 inches.

Randolph & Clowes, of Waterbury, Conn., send us a catalog entitled "Touching a Tubular Triumph," describing and illustrating the manufacture of seamless drawn brass and copper tubes. The catalog is standard size, 3½ x 6 inches.

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Manufactures.

At Franklin, N. H., the Aiken woolen mill is to have addition erected.

The Aiken Manufacturing Company, Bath, S. C., will add new machinery.

At New Boston, N. H., George Marden is erecting an addition to his mill.

It is expected that at West Newton, Pa., a new tin-plate mill will be erected.

N. K. Fairbank & Co.'s factory, at St. Louis, Mo., is to have an addition erected.

Mr. James E. Anderson, of Ellsworth, Me., contemplates the erection of a new shop.

The Hollidaysburg (Pa.) Iron & Nail Company will add a new steel plant to its works.

Edward B. & Harry S. Munson contemplate the erection of a new factory at New Haven, Conn.

J. Waters, of Brooklyn, N. Y., is about to have erected on Bath avenue, that city, a foundry.

The Norwich Bleaching, Dyeing & Printing Company, of Greenville, Conn., are to have an addition made to their plant.

The Whitney Mfg. Co., St. Louis, Mo., will, when its lease expires, remove to Baden, Mo., and build an extra new plant.

At Victoria, Tex., the plant of the Bailey Mills Company was destroyed by fire recently, the damage amounting to $20,000.

The Bellaire Steel Co., of Bellaire, O., has closed down for a period of six weeks, during which time the plant will be extensively enlarged.

The Continental Match Company, of Ogdensburg, N. Y., contemplates the building of new factories. Edwin Gould is president of the company.

At Austin, Tex., the Dallas Foundry & Machine Company has been incorporated. J. W. Fuller, George W. Sams and Joseph Chase, of Dallas, are among the incorporators.

The foundry works of the Geo. Sweet Mfg. Co., at Danesville, N. Y., which were recently destroyed by fire, are to be rebuilt, and new and improved machiney will be installed.

The Premier Manufacturing Company has been incorporated at Hartford, Conn. The company will manufacture carriages. The stockholders are G. W. Crawford, of Delhi, N. Y.; C. T. McCue, W. Bradford Allen, of Hartford.

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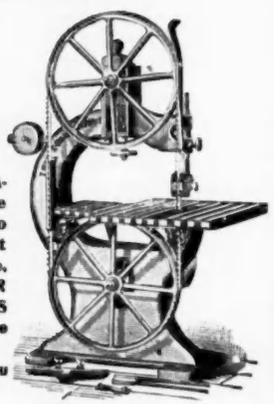

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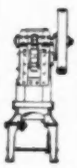

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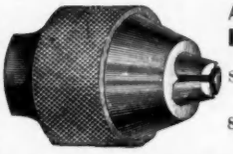

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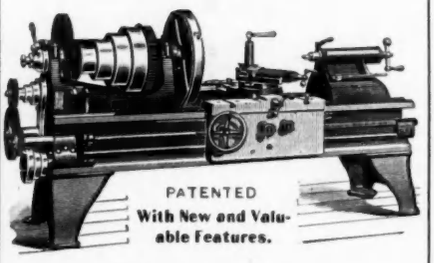

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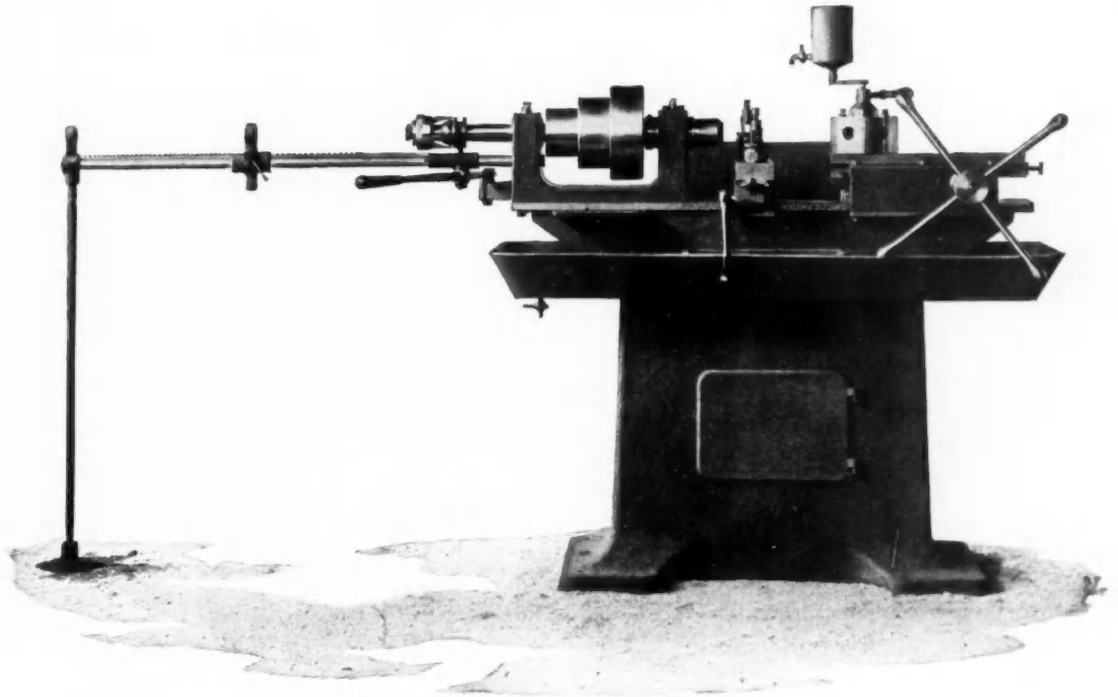

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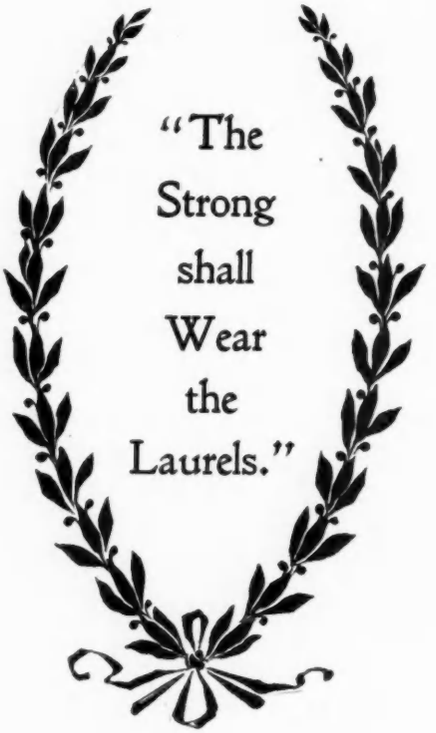

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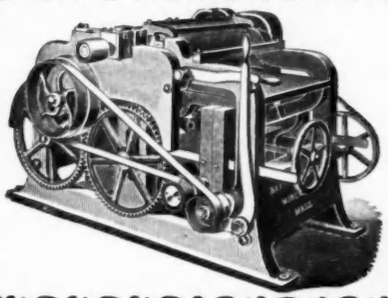

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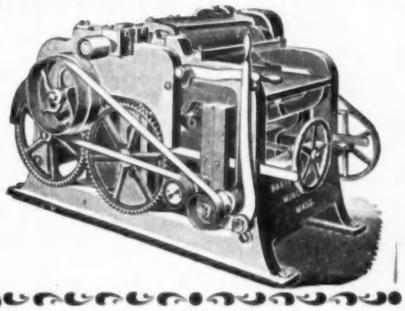

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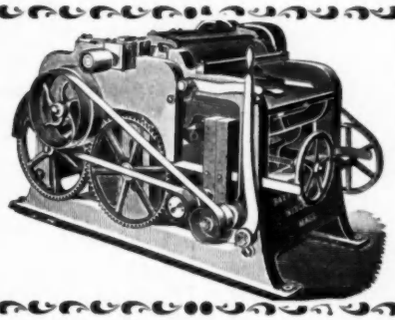

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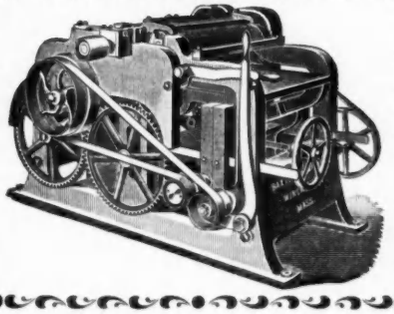

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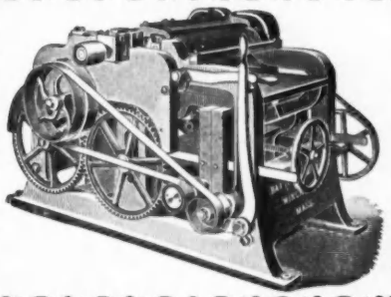

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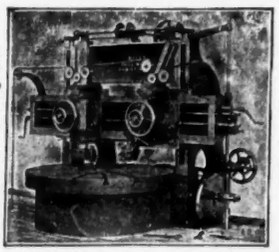

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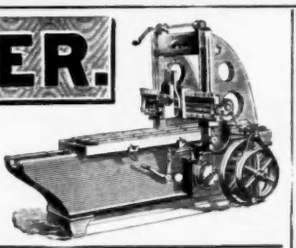

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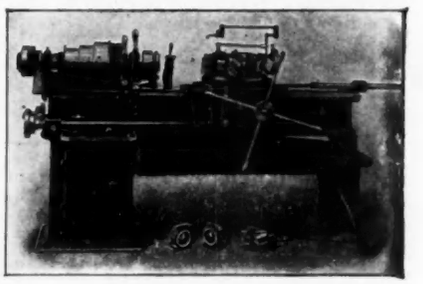

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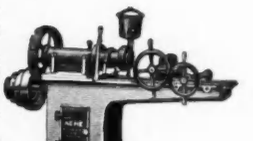

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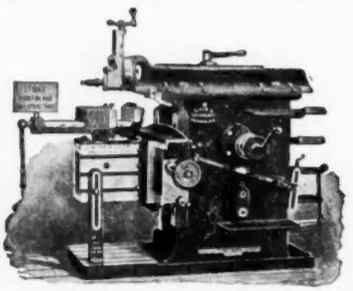

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